



Operating Manual

Activity 800

A product of smart optics Sensortechnik GmbH



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1. SERVICE

The images to be seen in these instructions can deviate from your scanner as well as from individual components. A deviation of the software version in the images in relation to your installation is also possible.

These instructions are continuously further developed and expanded by us. Deviations from these instructions and your Activity scan software cannot be excluded. Ask your specialist dealer about current software updates.

Bochum, August 2011.

2. TECHNICAL SPECIFICATION

Dimensions	440 x 500x 450mm
Weight	approx. 25kg
Supply voltage	100-240V, AC, 50-60 Hz
Power consumption	approx. 15 W, MAX 60W
Admissible temperature range	18-30°C
Resolution	Basic resolution of the 3D measuring head: 50 μ m
Accuracy	20 μ m
Output data format	STL
Interfaces	USB
Scope of delivery	Scanner, mains cable, 2 x USB cable, Back Up CD and calibration date, operation manual, calibration body

3. EC DECLARATION OF CONFORMITY



Sensortechnik GmbH
Sinterstrasse 8a
44795 Bochum, Germany

Declaration of CE conformity

according to EU-regulation 2006/42/EG

We declare that the device identified below complies with the requirements of the EU guideline which regard to safety and physical health requirements both in concept and construction put in circulation.

This declaration becomes invalid in case of an unauthorized change of the device.

Device description:	Optical 3D Scanner
Device type:	Activity 800
EU guidelines applicable:	Machine directive (2006/42/EC) EMC directive (2004/108/EC)

Harmonized standards applied:

EN 12100-1, EN 12100-2, EN 61000-6-1, EN 61000-6-3, EN 60950

The CE label was used first for this product in 2011.

Document prepared by: Jörg Friemel

Signature:

A handwritten signature in black ink, appearing to read 'Jörg Friemel', is written over a light blue horizontal line.

Bochum, 22.02.2011

4. INTENDED USE

The intended use of the scanner "Activity 800" consists of the optical three-dimensional measurement of dental plaster models.

Any use apart from the intended use is strongly discouraged as inappropriate use could cause material damage and personal injury.

5. GENERAL SAFETY INSTRUCTIONS

The following safety instructions must be observed for the installation, startup and use of the scanner: The instrument is intended for use in dry and closed rooms only.

The instrument has been developed and manufactured in accordance with the valid safety standards and with the greatest of care. In spite of these measures, it cannot be excluded that a hazard could arise with regard to electric shock, overheating or fire as the result of a technical defect in individual components.

Therefore switch off the instrument when you are not using it or if the instrument is unattended for longer periods, for example overnight. This will also benefit the environment as electrical energy is also saved this way.

The instrument may only be operated on a stable base (table, workbench, etc.) whose bearing strength has been measured to be at least twice the weight of the scanner as defined in the *Technical Specification*.

The base must be securely connected with a building wall or be equipped with a laterally braced bottom frame that is able to absorb any oscillation arising during the operation of the scanner.

Besides the pure bearing strength, the stability of the base is decisive for the safe operation of the scanner.

The printed instructions for transportation and storage must be observed while lifting and transporting the scanner.

No objects may be placed on the scanner as they could fall down due to the surface or the oscillation arising during operation of the scanner.

It is essential that the scanner is disconnected from the mains switch before objects, which have fallen into the scanner, are retrieved or the inside of the scanner is cleaned.

If you should detect damage or a functional defect on the scanner, the instrument must be labelled as defective to prevent further operation until the scanner has been repaired.

ATTENTION: Please ensure that you do not place any other objects in the scanner. During manual and automatic operation, ensure that no fluttering objects get into the opening of the scanner. While you are using the instrument, make sure that no body parts can be trapped in the flap /mechanics. smart optics assumes no liability for inappropriate use of the instrument.

6. INSTALLATION

6.1 Selection of the setup site

Select a suitable setup site before you install the scanner.

If decide to install the PC that is required for the operation of the scanner below the table, an area of at least

1.1m x 0.75 m (front width x depth) should be available.

If your PC is also to be placed on the table, this area must be increased by the dimensions of the PC.

The selected work place should not be facing windows or powerful artificial lamps as too powerful ambient lighting can lead to undesirable reflections on the monitor and, in extreme cases, to impairment of the results of the optical scanner.

6.2 Unpacking



The scanner has a weight of approx. 25 Kg.

It is essential that you observe the following instructions in order to lift the scanner out of its packaging and place it in its operating location in the appropriate manner.

Check the outer packaging for visible damage as soon as you receive it. If you detect damage on the packaging, notify the shipping agent as well as your specialist dealer.

The instrument is delivered in a specially designed carton on a wooden pallet or in an overseas wooden crate. After removing the straps, open the folded cover of the carton. Inside you will find a foam part that protects the scanner underneath from damage during transport.

Pull the foam part upwards out of the carton. You can then lift the entire carton.

Two people must always carry the scanner at the same time.

Prepare the destined workplace in such a manner that the scanner can be removed from the packaging and then placed in its place of operation at once.

Move the scanner on the pallet as closely as possible to the installation location before you remove the scanner from the packaging.

6.3 Accessories

The accessories to the scanner are at the bottom of the packaging. Check the scope of delivery for entirety.

The scope of delivery comprises:

- 1 Scanner
- 1 Power cable
- 2 USB cables
- 1 Allen wrench
- 1 User manual
- 1 Calibration body
- 1 Backup CD
- 1 Removable object holder

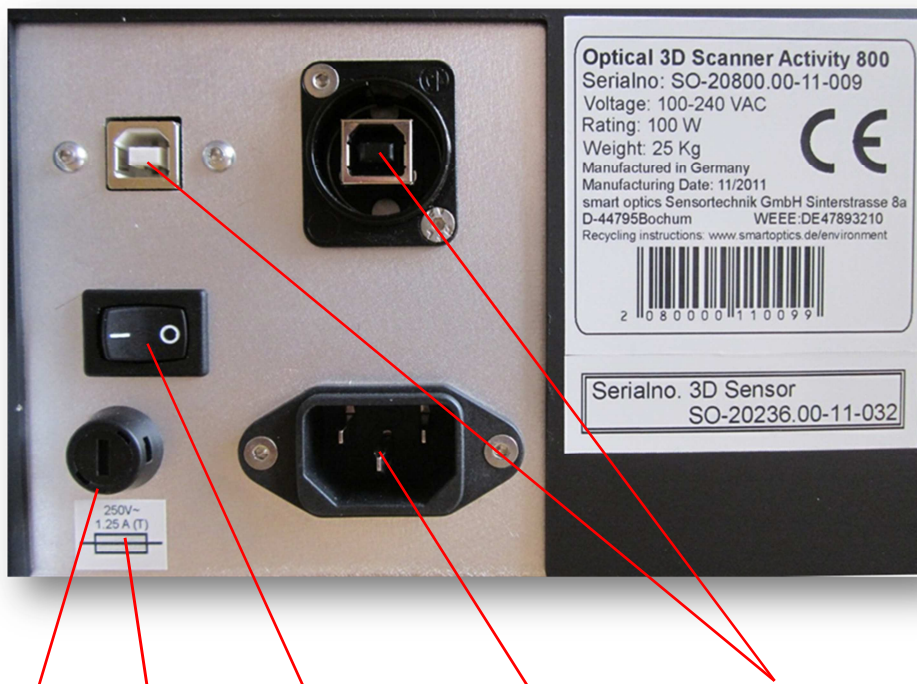
7. INSTALLATION

7.1 Installation of the scanner

Prior to installation, ensure that the power switch at the rear of the instruments is set at 0.



Plug the ends of the two USB cables into the USB bushes at the rear of the instrument.



Fuse, fuse label, mains switch, mains connection socket, USB connections, nameplate

1. Connect the other ends of the UCB cables to the corresponding USB port at the rear of the PC.
2. Connect the power cable to the mains connection of the scanner and to a mains socket.
3. Turn on the scanner at the main switch.
4. Then switch off the scanner and continue with the installation of the PC and the operational software ([see separate installation instructions](#)).

8. ACTIVITY SCAN SOFTWARE

8.1 Symbols



Ends the scanner stand-by mode



Starts the matching process



Combines two measurements with each other



Adds a new measurement/ clamp setting



Triggers **a** 3D measurement

Triggers **three** 3D measurements. The object holder rotates by **120°** three times.

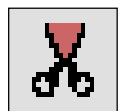
Triggers **six** 3D measurements. The object holder rotates by **60°** six times.



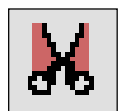
Interruption of scan



Continue in Workflow.



Cuts data within the selection



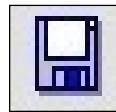
Cuts data outside the selection



Reverses the last cutting process or the last measurement.



Opens the dialog "Fill holes"



Saves the current step



Opens the dialog "Settings"



Product information



Ends the Activity software



Starts the 3 point alignment



Starts the interactive alignment



Confirms the combination of two measurements; closes the current scan project

8.2 3D Viewer Symbols (Object View)



Shows the camera angle



Synchronises the 3D Viewer with the camera live image



Shows the front view



Shows the back view



Shows the left side



Shows the right side



Shows the top side



Shows the bottom side



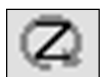
Shows data set in isometric alignment



Rotation of the object around the X-axis



Rotation of the object around the Y-axis

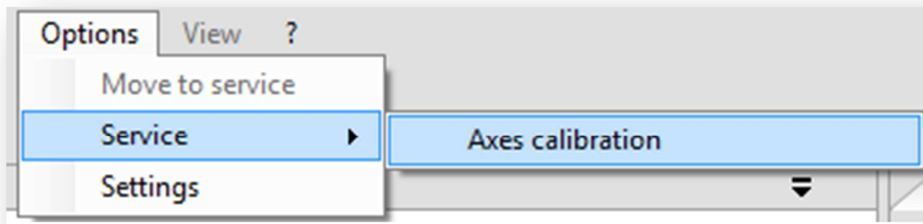


Rotation of the object around the Z-axis



Three-dimensional rotation of the object around a fixed point

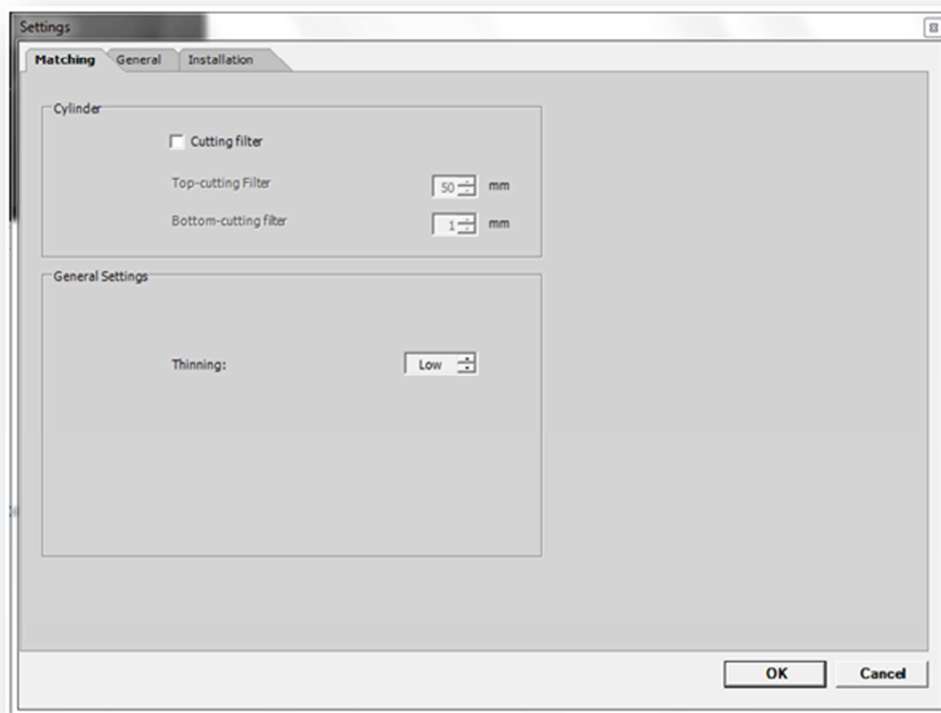
8.3 Activity Menu Options



Options:

Under *Extras* → *Axis calibrations*, the scanner axes can be calibrated.

8.4 Options → Settings → Matching



Base:

With the check box, a **cutting filter** is activated that cuts the upper and/ or lower area of the STL data set. The unit of measurements is millimetres.

Global Settings

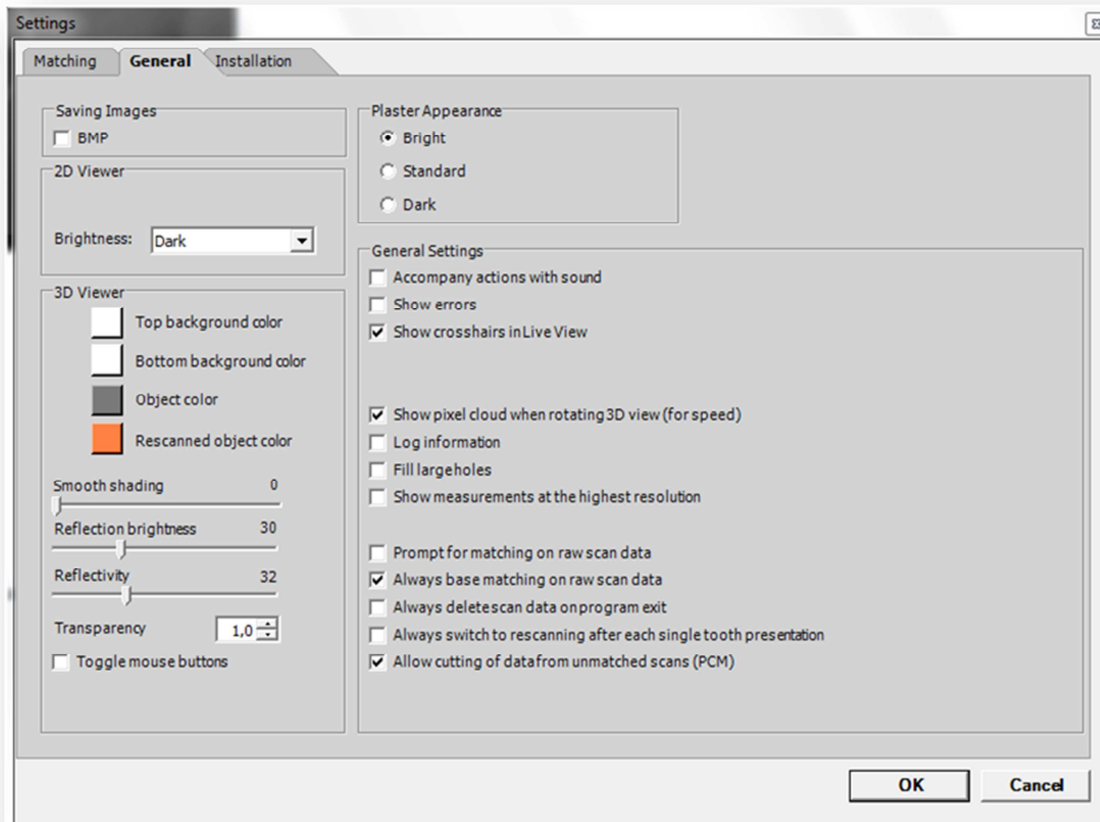
The STL precision and consequently the data size are determined with "Thin out". With "OFF" the maximum resolution of the sensor is reproduced.

Under "LOW" a somewhat greater distance of the pixel is linked to a data set.

This distance can be increased further with "MEDIUM" and "STRONG".

"AUTO" varies the thinning out according to selection. The greater the thinning out, the smaller the linked data set.

The highest accuracy is achieved by a weak thinning out.



Saving images

BMP:

On activation, a **BMP** (Bitmap) is created of the respective imaging position. This image, in which the stripe-light pattern is visible, is also saved in the project directory. These images serve as an aid in the case of arising measurement errors.

2D Viewer

Light intensity:

The light intensity of the camera live image can be set here. These settings have no influence on the 3D measurements.

3D-Viewer

Top colour

The background colour of the viewer for the upper area is set here.

Bottom colour

The background colour of the viewer for the lower area is set here.

Object – colour

The colour of the 3D object is set here.

Object-Colour Rescan The colour of the last manually added image is set here.

Extra smoothing

Smoothens the surface of the 3D slide in the viewer even more. This setting has no influence on the 3D measurement.

Light intensity of the reflection

Adapts the reflection of light to the slide in the 3D viewer.

Degree of reflection

Adjustment of the intensity of the reflection on the object in the 3D viewer.

Changing the mouse function

When the check box is activated, the allocation of the key commands of the mouse is changed to shift and rotate the object in the 3D viewer.

Type of plaster

This influences the light intensity of the sensor during a measurement. "Light" for white plaster, "Medium" for beige, and "Dark" for dark plaster.

Global Settings:

Sound for actions

When activated, the computer transmits a signal via the installed loudspeaker for every request. However, this function is not supported by every PC system.

Error message display

When "Error message display" is activated, a window appears indicating the relevant error message and description in the case of occurring exceptions.

Movement reduced

When the check box is activated, the object in the 3D viewer is displayed as a pixel cloud when the mouse is moved. This optimises the speed of display during the movement.

Log Information

When activated, each step of the scanner, the software and the communication is saved in a special folder. This function is required for the technical support. A log file is written that records all settings and procedure issues a detailed error message in event of problems.

Filling large holes

Isolated scan holes can be closed using this function. The size of the hole to be closed is restricted by the entry of the area in mm². We recommend using this function only with flat surfaces. Faults at preparation margins or at sharp occlusal edges should not be supplemented with this function as the area to be replaced is only interpolated.

Show measurement with higher quality

When the check box is activated, the object in the 3D viewer is displayed with an even higher resolution. The calculation of the object when new images are added as well as with movements requires a considerably higher performance of the graphics card and can lead to time delays.

Enquire after matching to scan data

This function can be used to define whether the existing STL or the existing individual images should be matched. The enquiry follows only when an STL already exists.

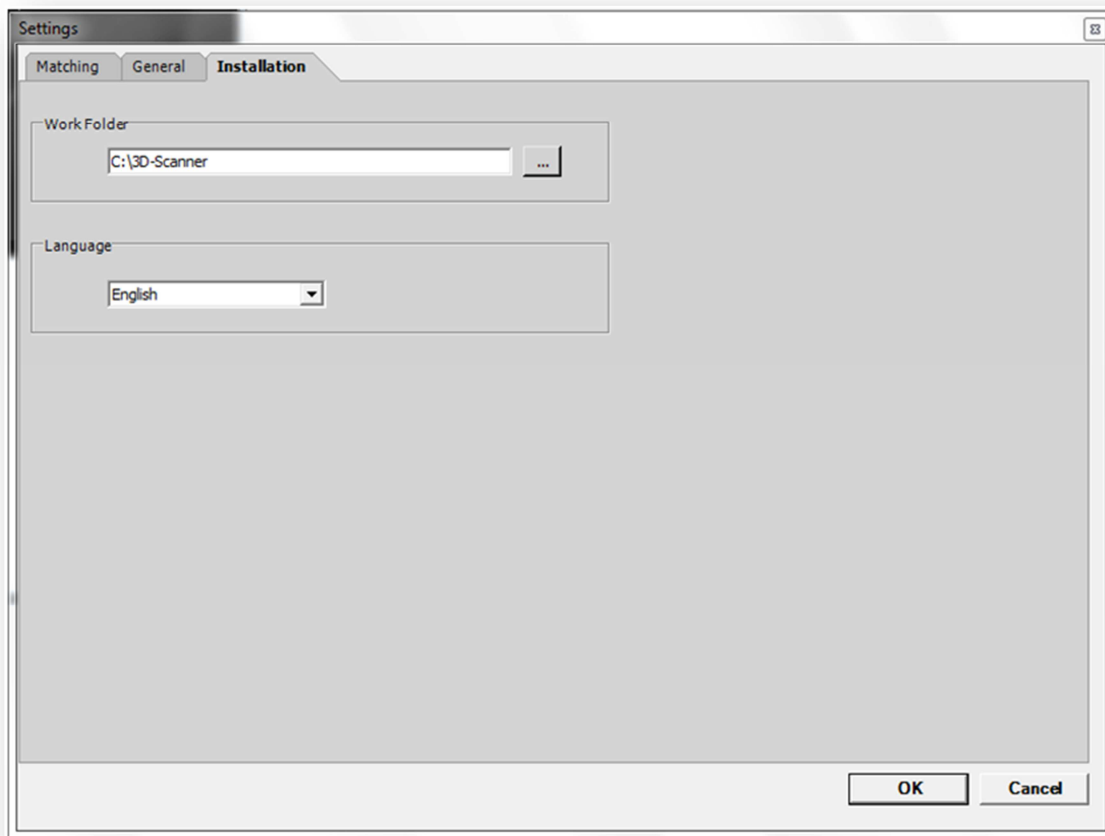
Always match to scan data

To create the STL, the existing individual images are again used for the subsequent or supplementary scans and an existing STL is principally not used for the calculation.

Always delete scan data on ending the program

When the program is closed, the existing individual images are automatically deleted irretrievably without enquiry without a query.

8.5 Options - Settings - Installation



Work directory

The memory of the scanned data can be changed here. All data are created and filed in this folder. To change this memory folder, click the "Browse button" and store the newly selected memory folder. Confirm by clicking on "OK" to continue.

Language:

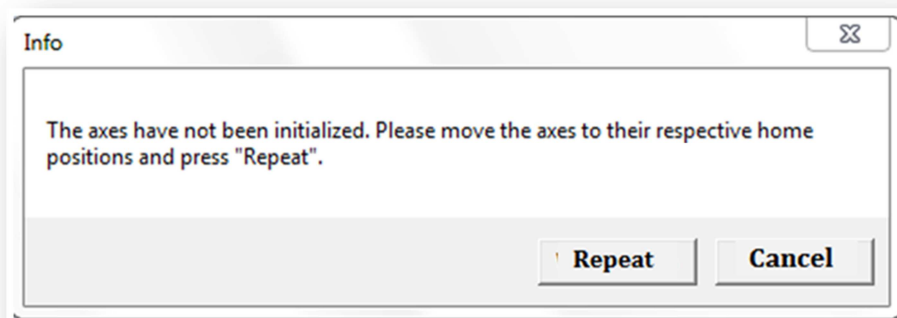
The language is adapted to the user interface here. The following languages are available:

German, English, Spanish, French, Italian, Portuguese, Rumanian, Turkish or Russian

9. OPERATION

9.1 Initialising the axes

After switching on the instrument and the first start of the scan software, a message will appear indicating that the axes have not yet been initialised. The axes are initialised by turning the pivot axis to the left and to the right as far as it will go and turning the axis of rotation by 360°. When you have accomplished this, click the "Repeat" button to initialise the axes once again.



9.2 Setting the object holder

The scanner is designed for highly flexible handling. The scan object can be brought to the required height and position by the special object holder and the height-adjustable screw connection:



The screw **1** enables infinite height adjustment and rotation of the model. Ensure that adequate stability is also guaranteed in the elevated condition.

Screw **2** enables infinite horizontal shifting of the model.

If you wish to scan in an extreme position, check whether there is any danger of the model colliding with the swivel arm during the scanning due to the rotation. A collision could damage the scanner!

Screw **3** fixes the model positioning system on the axis of rotation of the scanner. This screw should not be manipulated!



The following procedure is a recommendation not a directive!

The individual steps are dependent on the case to be scanned and can be changed accordingly by the user with a bit of practice! The model may not be removed from the object holder and the position on the object holder not changed until the end of the measuring procedure!

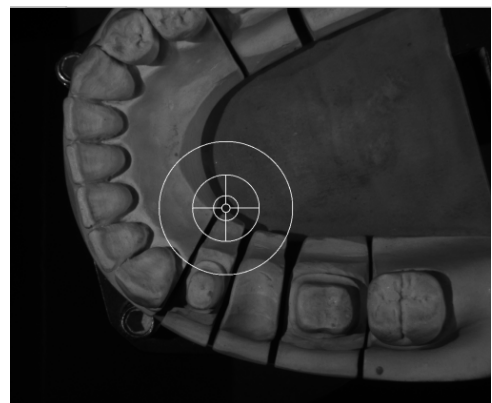
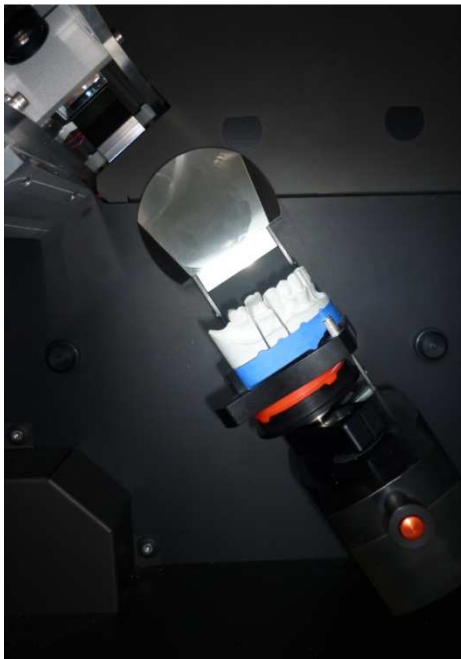
Move the pivot axis approx. 45° in a clockwise direction towards the camera to check and set the height in the camera live image.



The green line should be located at the height of the preparation line(s):



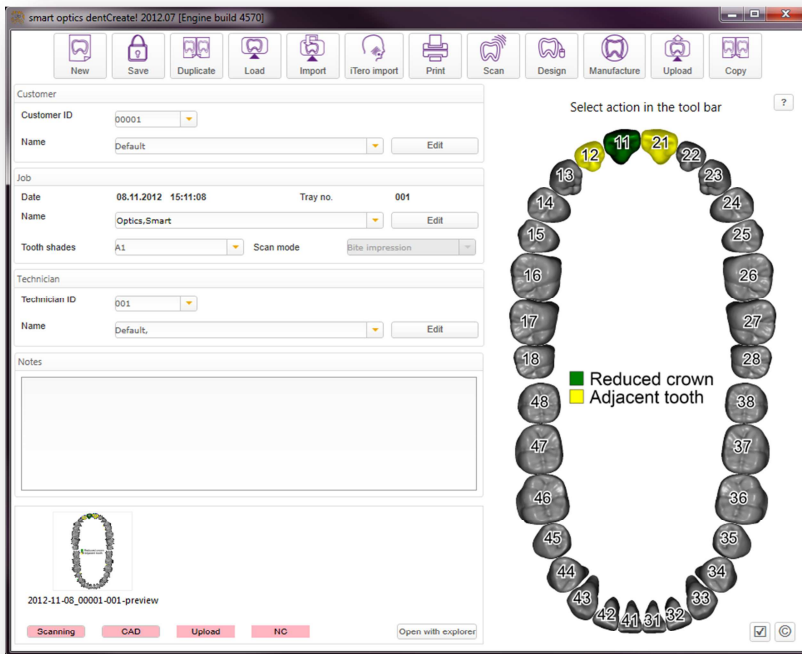
Move the object holder with the model approx. 25° in an anticlockwise direction and check whether the camera live image encompasses the area to be scanned.
The hair cross should be located in the middle of the area to be scanned



9.3 Scan procedure single crown and small bridge

Switching on the scanner. Create the job in the DentalDB CAD Software, save and click the scan button. The axes must be initialised first if the scanner has been switched on for the first time.

(see user manual under 8. and 9.)




Position the model as is seen in the camera live image:

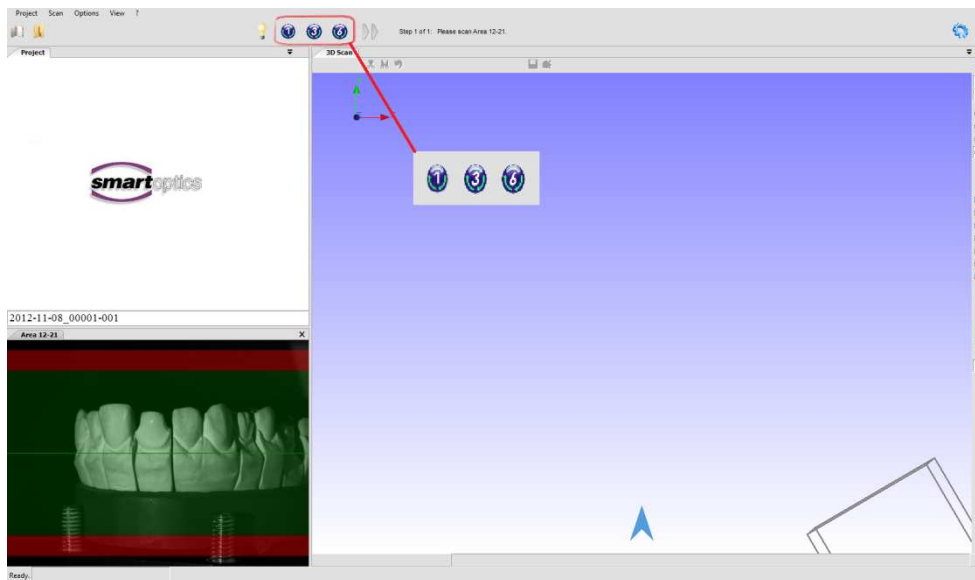




Now position the swivel arm vertically (45° position to the sensor) in order to capture occlusal and incisal areas of the job as well as the lateral areas. Only one quadrant can be scanned in one setting. Complete jaw scans can be performed with several settings. Up to three or more settings could be required according to complexity and size.

9.4 3D Measurements

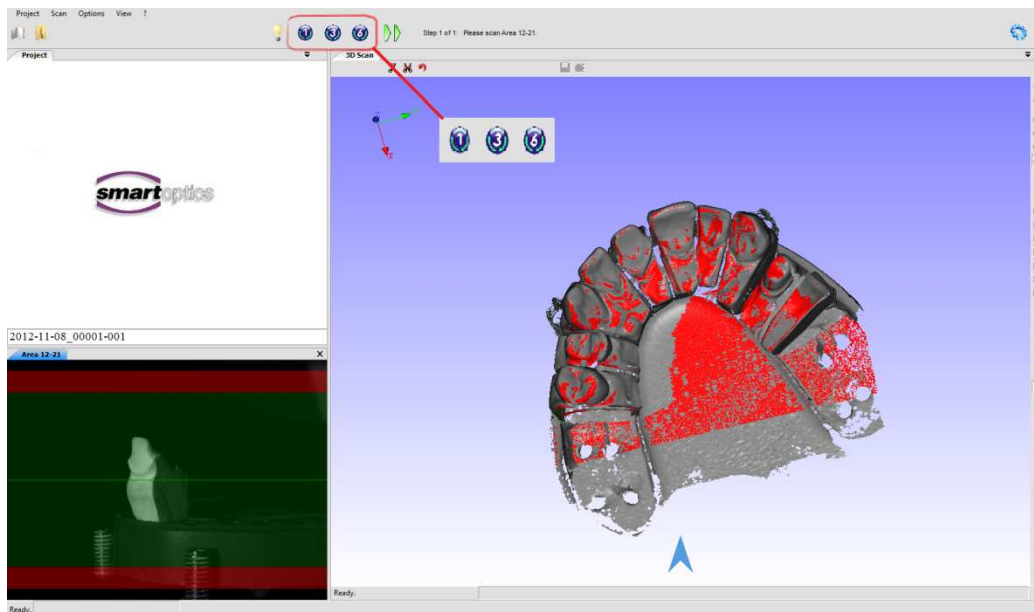
The corresponding number of measurements (1.3 or 6) are triggered by clicking on one of the buttons .



The scanned data are loaded into the 3D-Viewer and the scan results can be checked.

The object can be moved with the mouse as follows:

- Press the left mouse button to rotate the object
- Press the right mouse button to shift the object
- Use the scroll wheel to zoom into or out of the object



Potential voids can be closed by adding further measurements with changed scan angles. To achieve this, press the latch and reposition as required



Ensure that the position of the model on the object holder is not changed! This can lead to overlapping or shifting of the individual images and will complicate or even prevent the subsequent matching process.

Missing areas can be visually captured and optimally positioned for the imaging by the camera by the synchronisation of the 3D viewer with the camera live image. The different colouring of the last scan to be added enables the results to be checked in the 3D viewer.

Certain areas, especially proximal, cannot be captured due to the perspective of the camera as the adjacent teeth create a shadow during the stripe-light projection. In order to capture a die optimally, it must be displayed alone, i.e. the direct adjacent dies must be removed from the saw cut model.

Never remove the model from the object holder in this case but release the dies directly from the model base in the interior of the scanner.

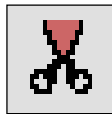
With the Activity Scan, there is a possibility to capture several dies that are not located directly adjacently in one scan as long as it is ensured that the preparation area of all the dies is easily recognisable during the scan procedure.

By changing the position of the swivel arm and the object holder, the areas to be closed can be localised with the air of the camera live image in the 3D viewer (the object in the 3D viewer moves simultaneously with the swivel arm and object holder).

The missing dental areas are supplemented by individual measurements. If all required areas have been captured (dies, adjacent teeth, alveolar ridge etc.), the data can then be reduced to avoid an excessive volume of data (danger of process retardation) being transmitted to the networking process.

9.5 Data reduction

The following tools are available for reducing the data:



Cuts data within the selection





Cuts data outside the selection





Reverses the last cutting process

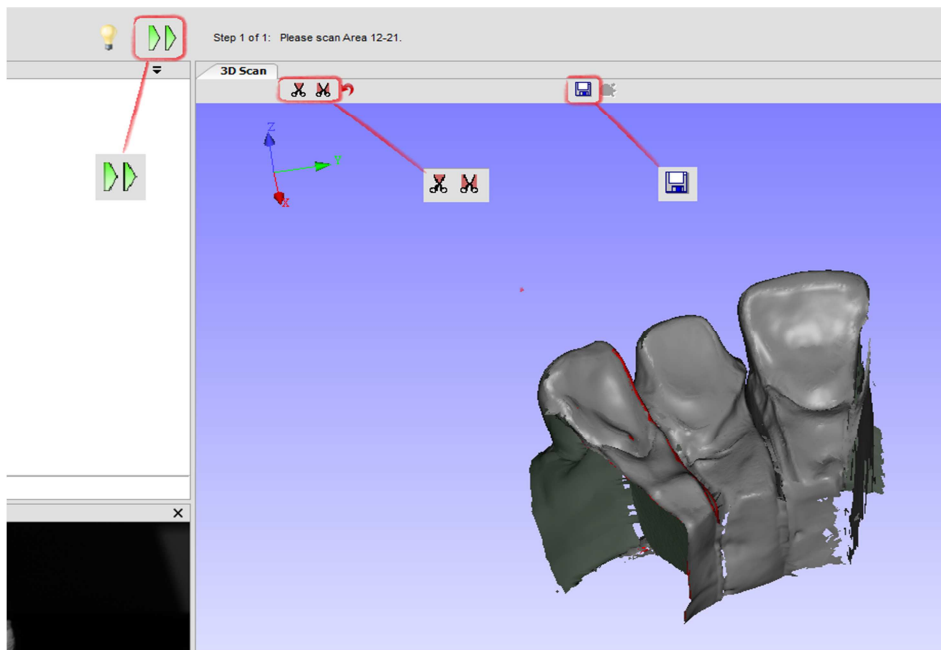
Data reduction procedure:

Activate one of the cutters   by clicking **(1)**

Points are set to define the cutting area with the left mouse button. The frame is closed with the right mouse button and the corresponding data removed.


Changes must be saved by clicking the save symbol  in the menu bar. **(2)**

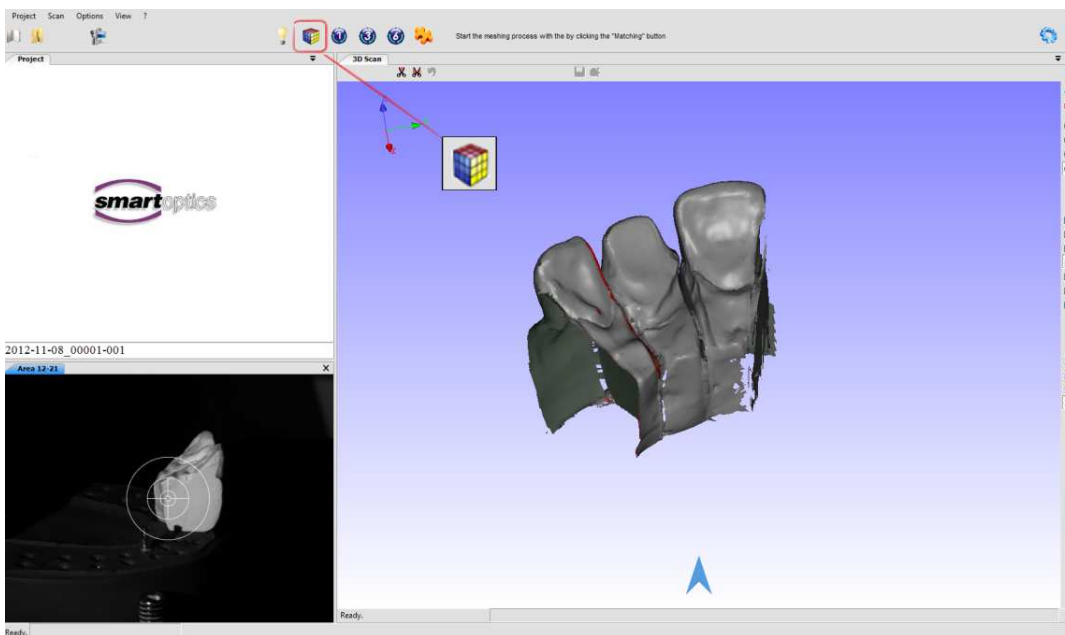
If the data reduction is completed, click the "Continue" button . **(3)**




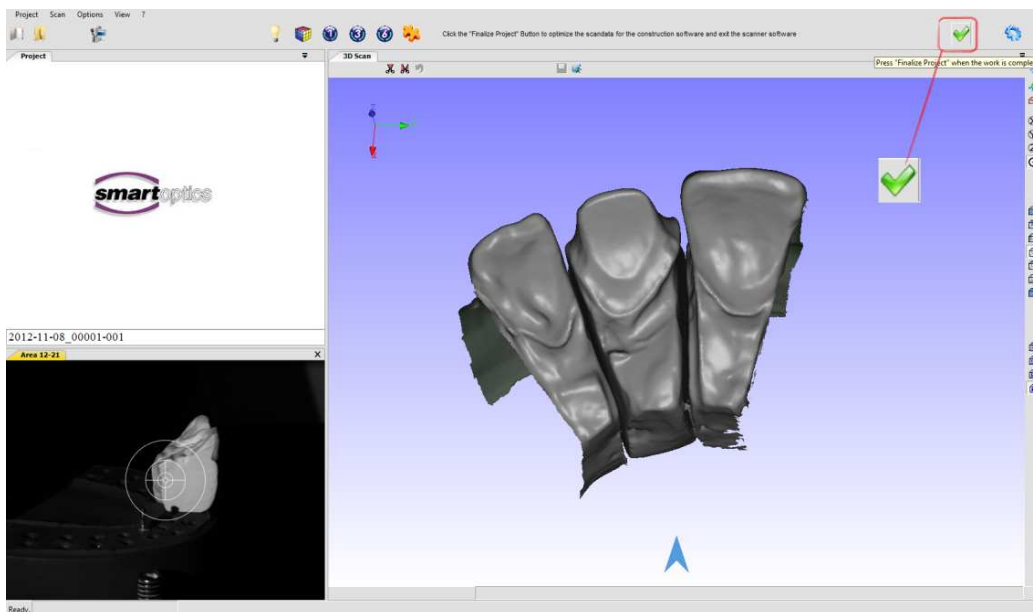
9.6 Matching Data

All relevant areas should be captured and displayed in the 3D view. The networking process can then be started.

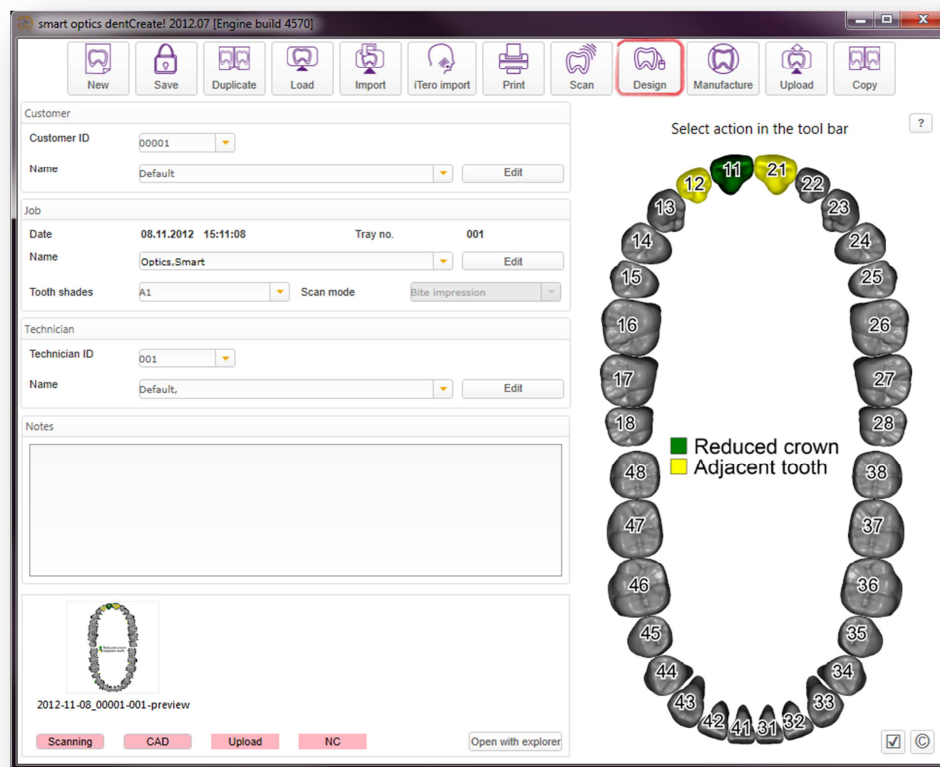
In this process, all measurements are fused together and an STL data set is created. The "Matching" button  starts the process.



With the  button, the scan software can be finished.



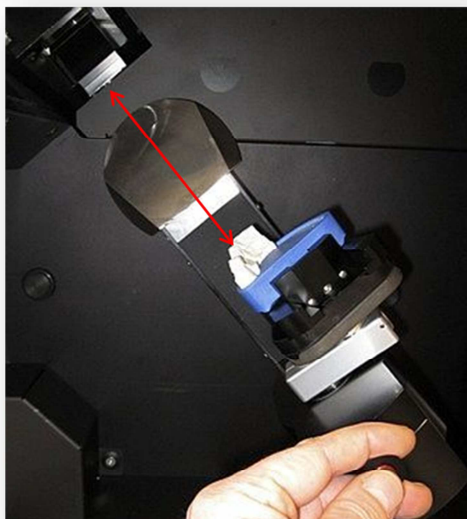
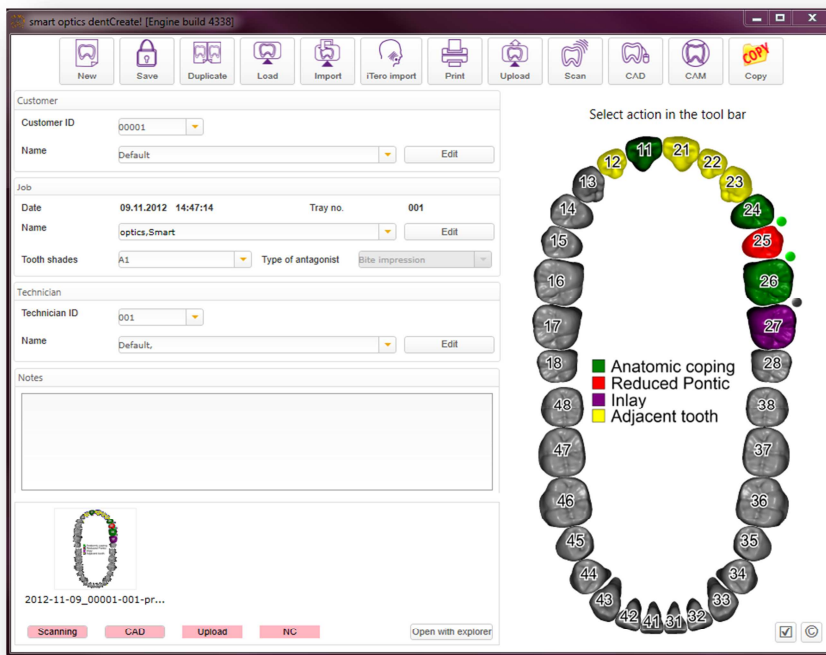
The job data sheet of the finished scanned work appears which is now ready for the computer aided design



9.7 Scan procedure for larger bridges or quadrant overlapping jobs

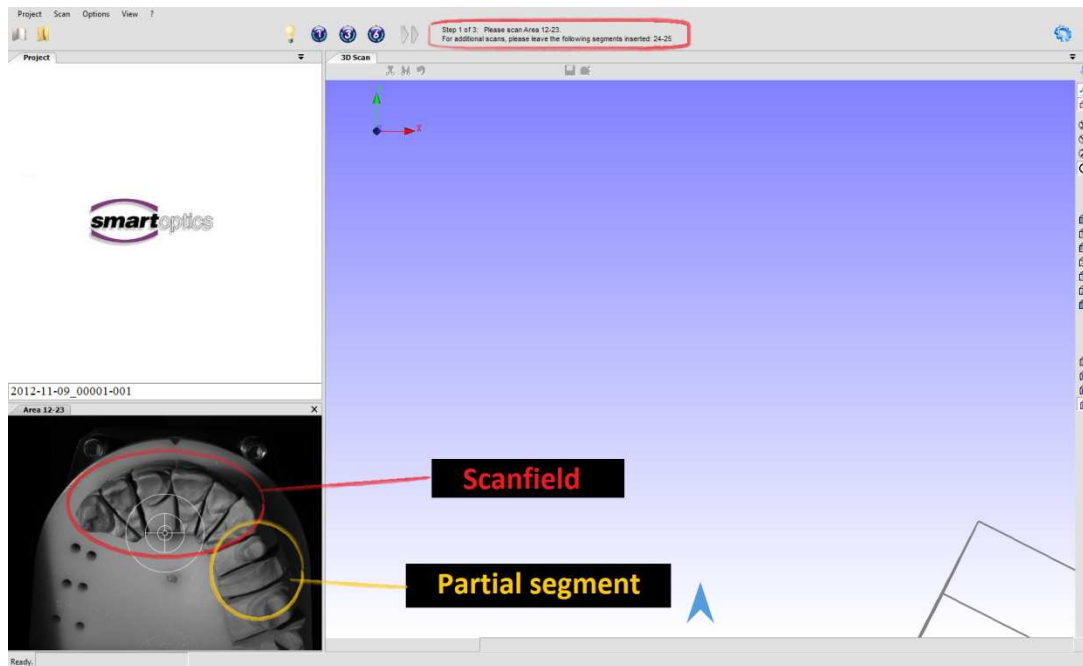
Depending on the size of the job or the size of the area to be scanned, it is possible that they cannot be captured by the camera in one scan step. Therefore several scanning steps could be necessary.

Creating job in the job data sheet




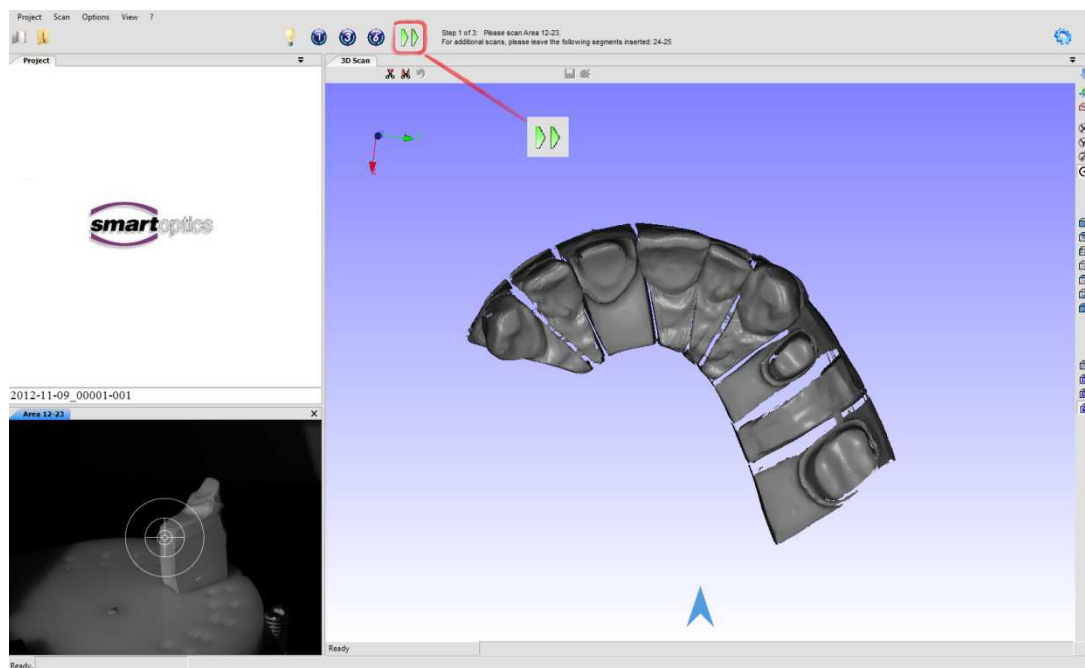
Position the swivel arm perpendicular to the camera and align the model to the first scanning area with the aid of the thread cross.

Ensure that partial segments (teeth, dies, gingiva) from the subsequent scan step 2 can already be scanned in scan step 1 as the software requires consistent scan data from both scanning areas for the subsequent matching of the partial areas (example here: teeth 24+25).

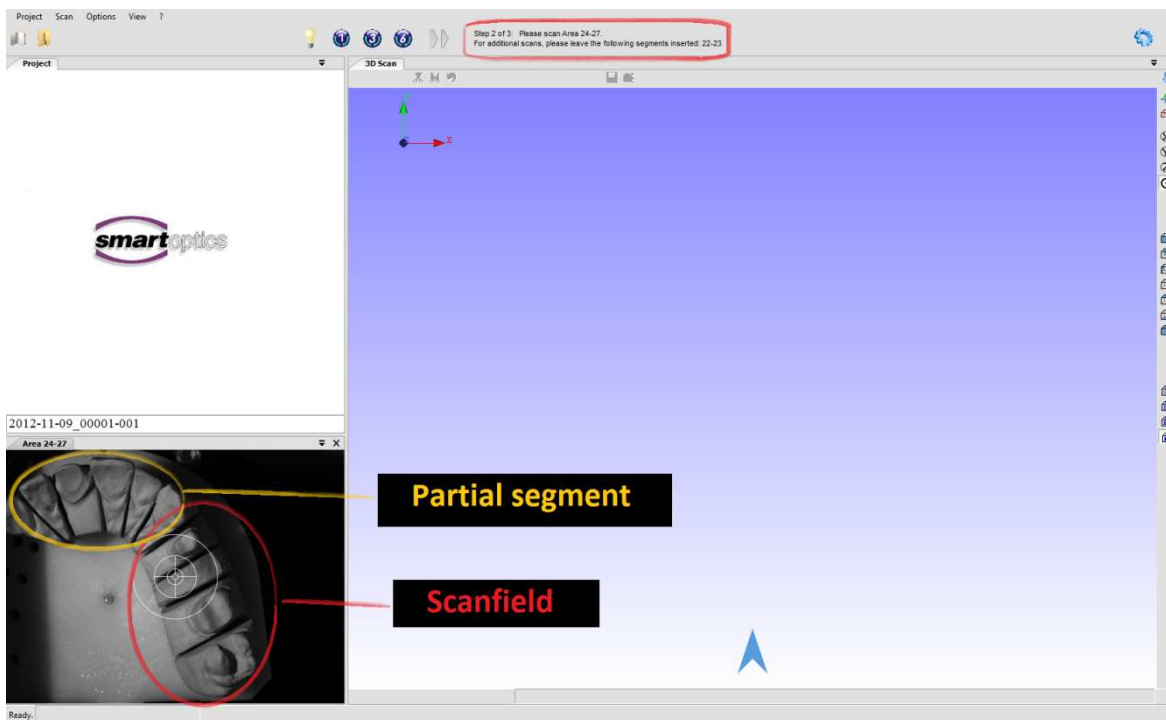



Analogous to the procedure with smaller jobs, areas that have not yet been captured can now be scanned (see page 20 ff).

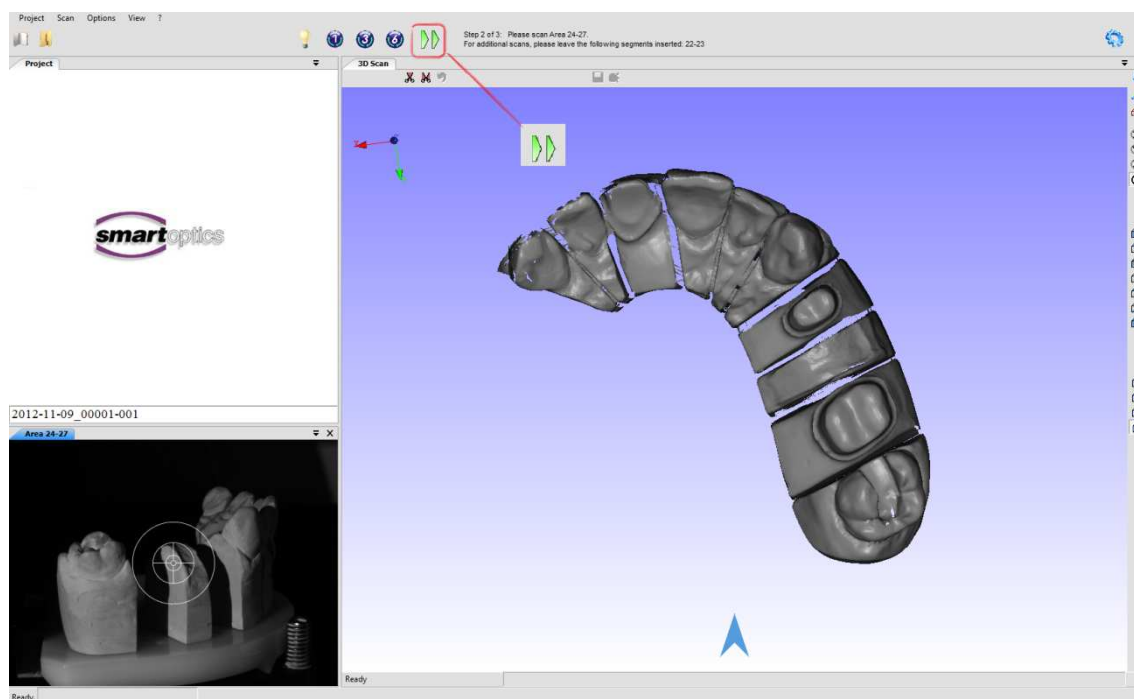
After the scan has been cut, save the new data situation with "Save"  (1). Continue in Workflow with "Continue"  (2).



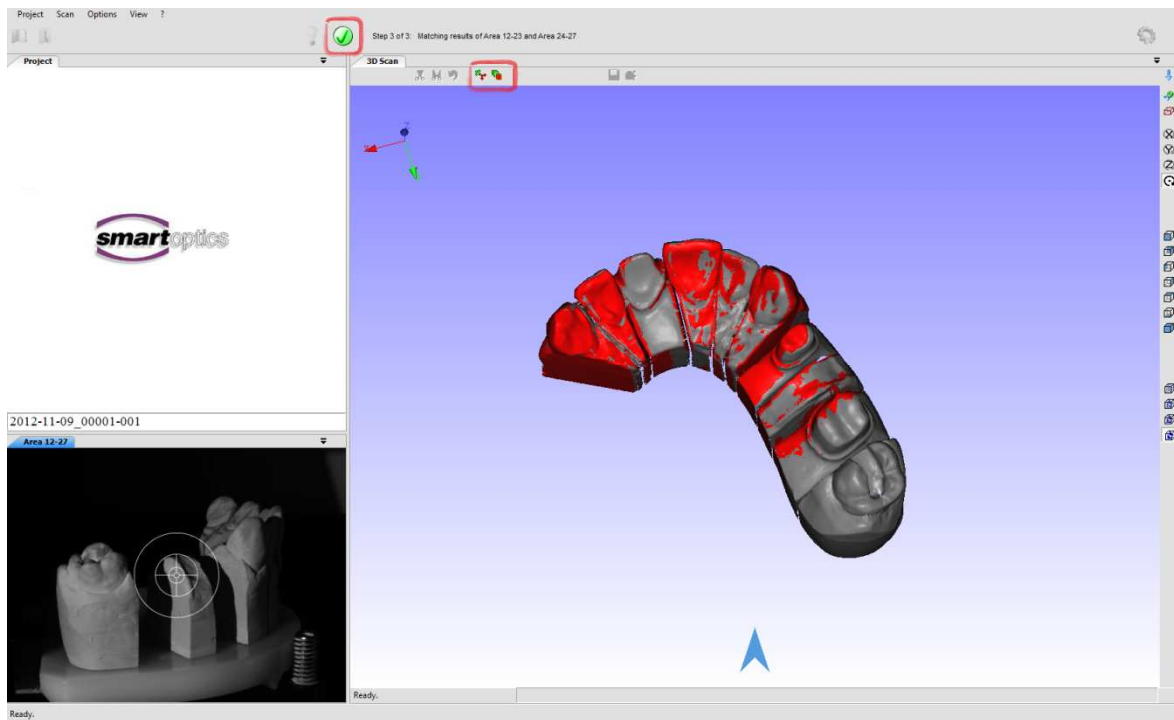
For the second scan step, position the next scanning area perpendicular to the camera and centrally in the scan field. You must ensure that the reference material from the first scanning area has also been captured (example: teeth 22+23).




Analogous to the procedure with smaller jobs, areas that have not yet been captured can now be scanned (see page 20 ff). When all relevant data have been captured, start the next step in the workflow by clicking the "Forwards" button .



The scanning areas 1 and 2 are now automatically merged into one data set.




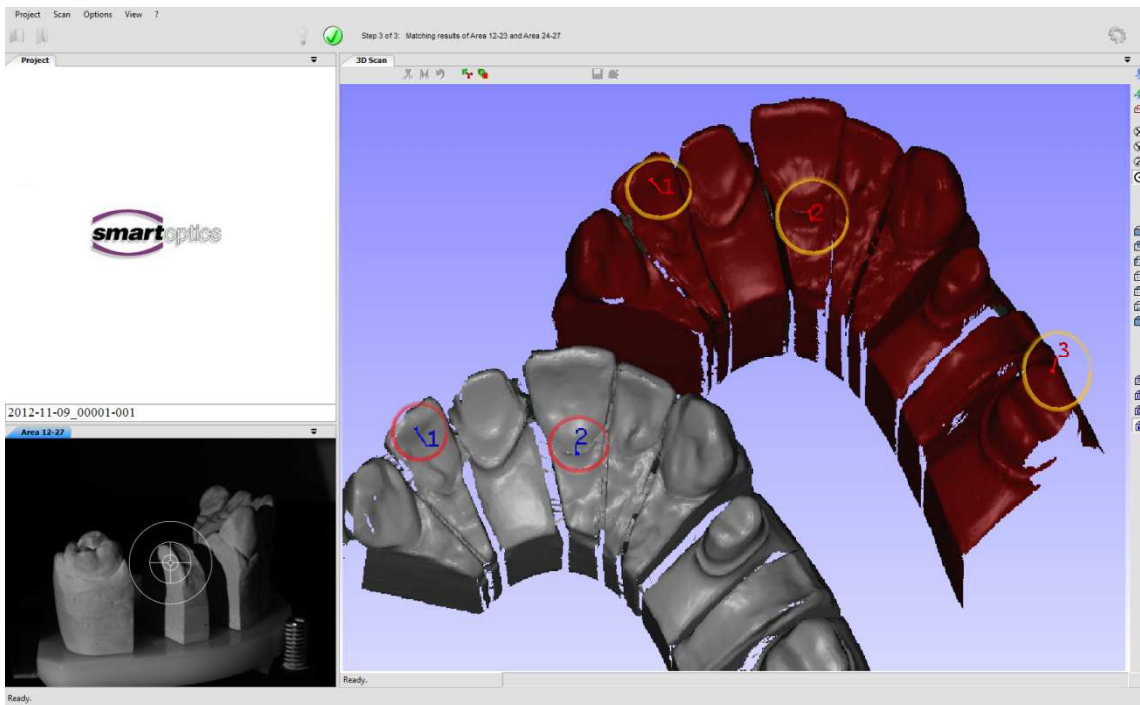
If this connection of the scanning areas 1 and 2 should not succeed automatically, it can be corrected manually.

The scans can be manually aligned with the button "Interactive alignment"  with the aid of the mouse.

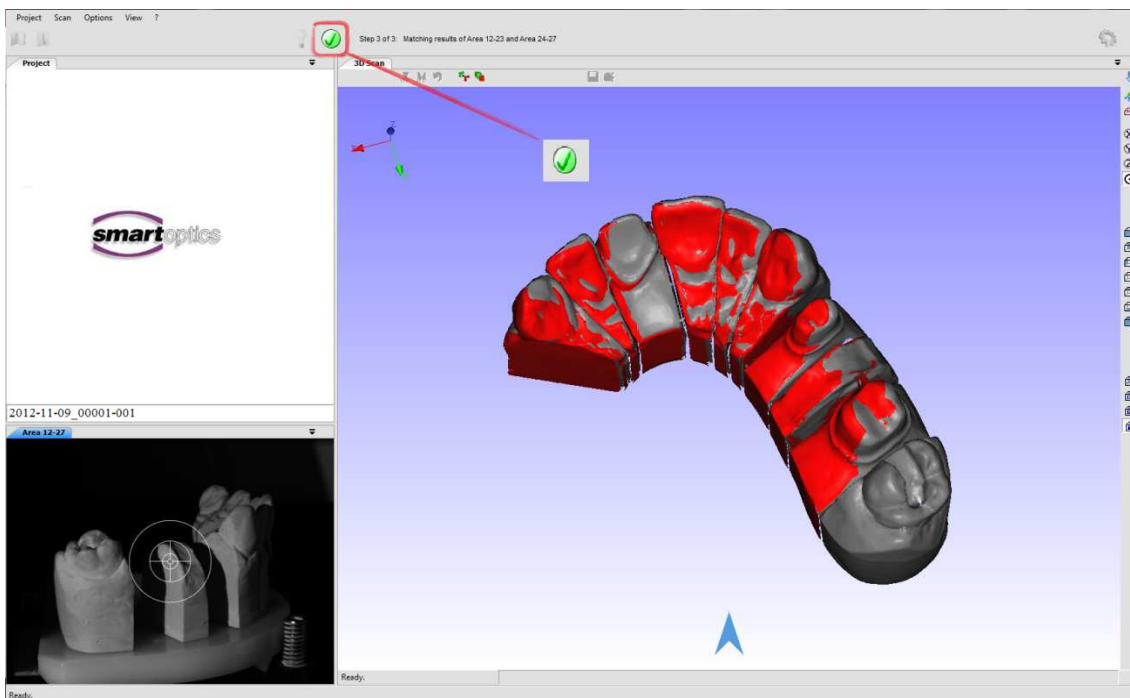
The object can be moved with the mouse as shown below:

- With the left mouse button pressed down, rotate the 1. object
- With the right mouse button pressed down, shift the 1. object
- Use the scroll wheel to zoom into and out of the object
- With the CTRL key and the left mouse button pressed down, rotate both objects
- With the CTRL key and the right mouse button pressed down, shift both objects


After clicking the button "Align points" , the scans can be joined together connected by manually setting points at identical, marked positions, if possible. There must be at least three identical points marked on the two scanning areas. Set point with the left mouse button, change between the scanning area with the space bar.




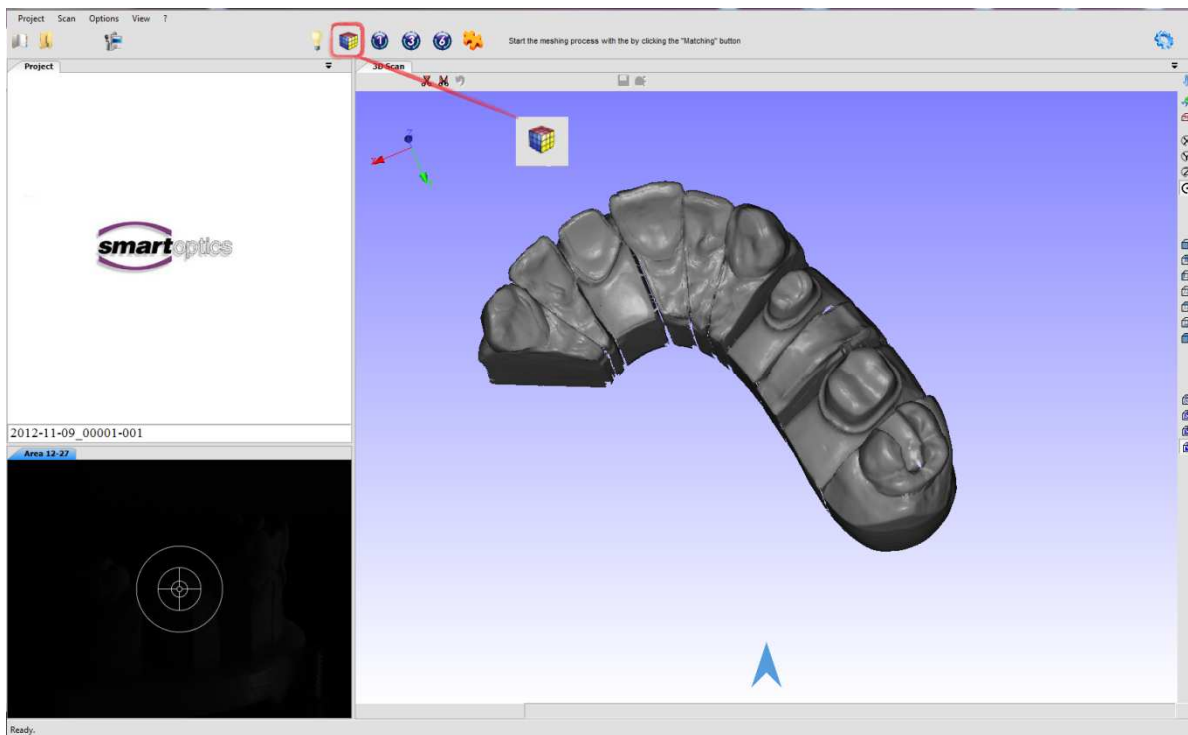
When the last point has been set on the second scan, the scanning areas are positioned towards each other by the software.



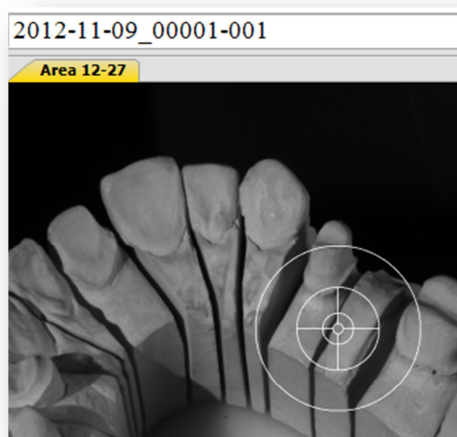
The initial assembly of the scanning areas represents a "rough positioning". The fine calculation follows automatically during the matching


The result of the merging of the scanning areas is confirmed by clicking the button .

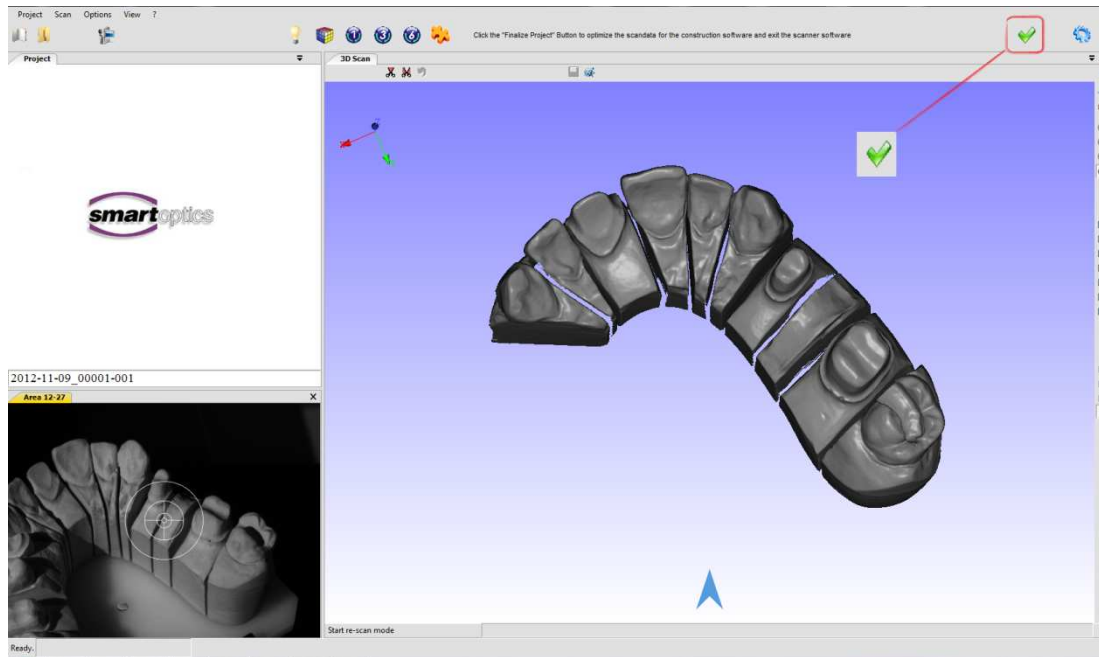
After the two scanning areas have been merged into one area, this must still be matched by clicking the "Matching" button .




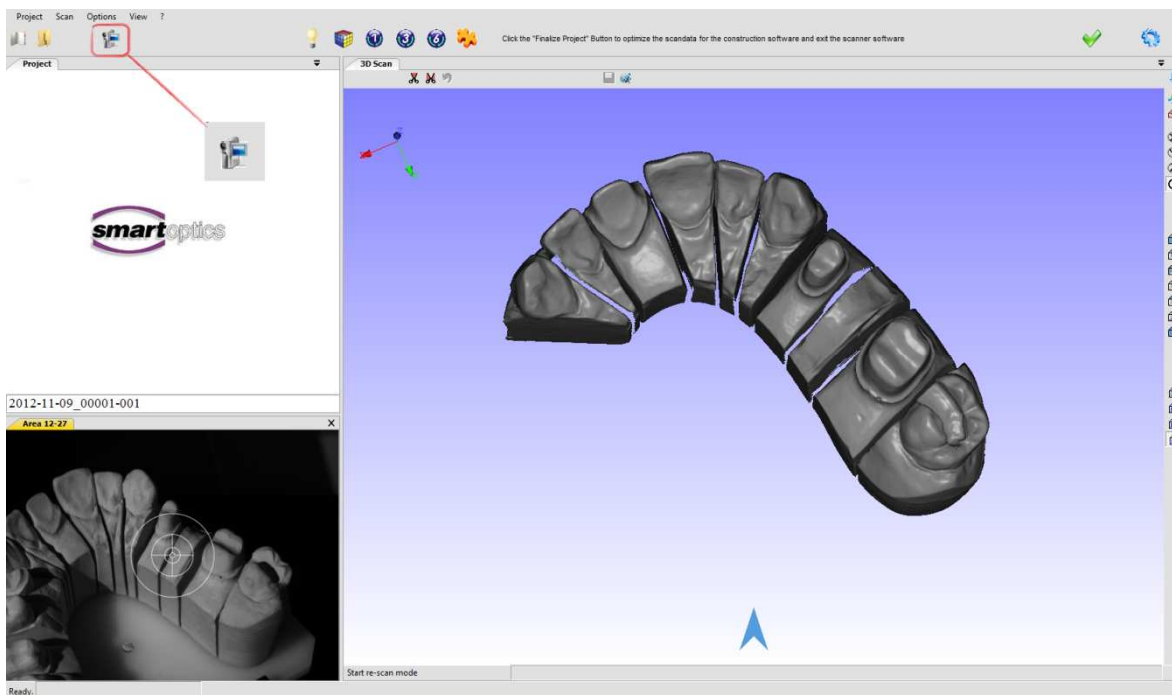
After successful matching, the area tab will be highlighted in yellow:



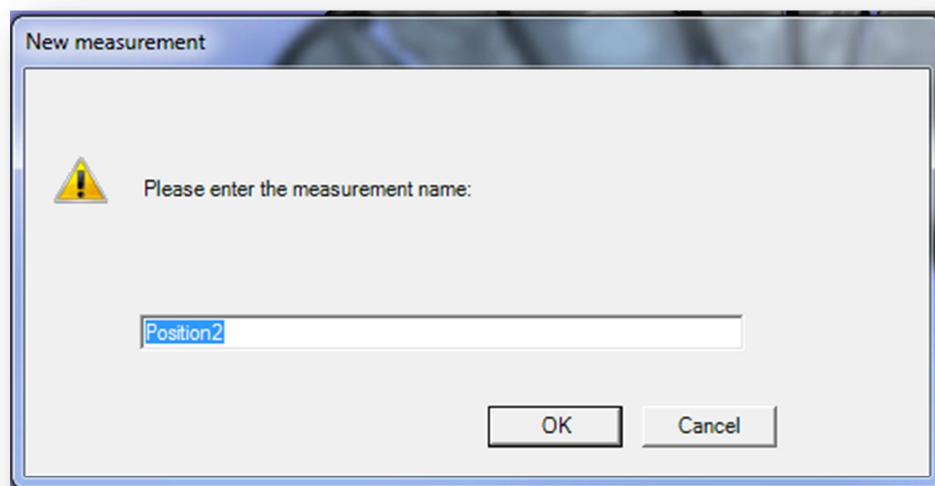
With the  button, the scan software can be ended.



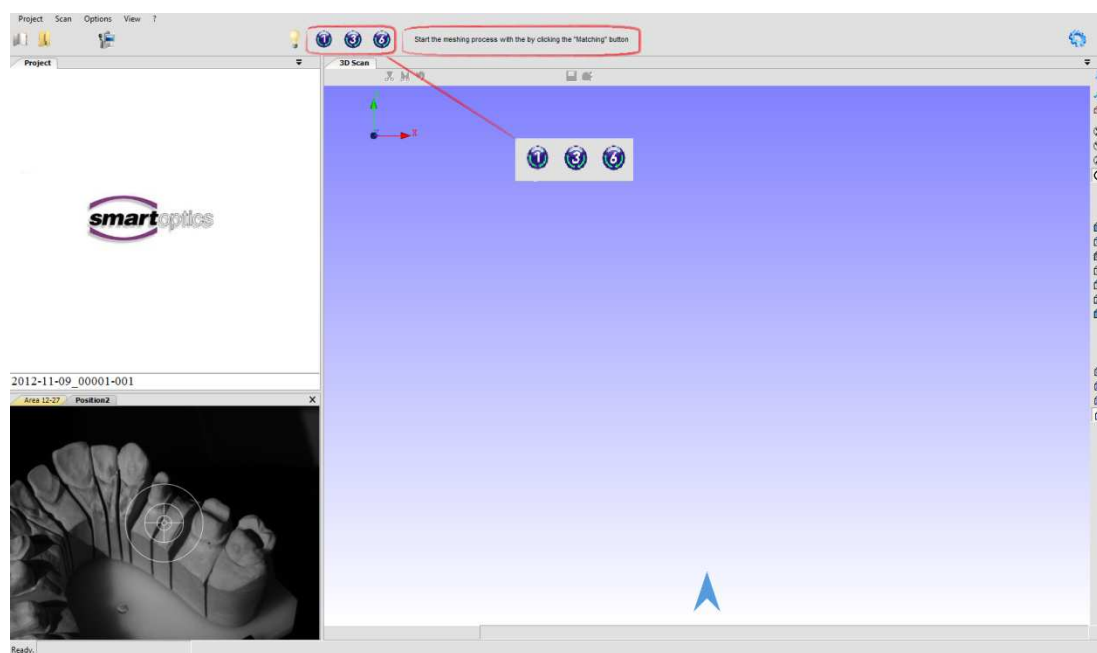
Optionally a manual scan can be performed by clicking the button  to capture areas subsequently that have not been scanned.



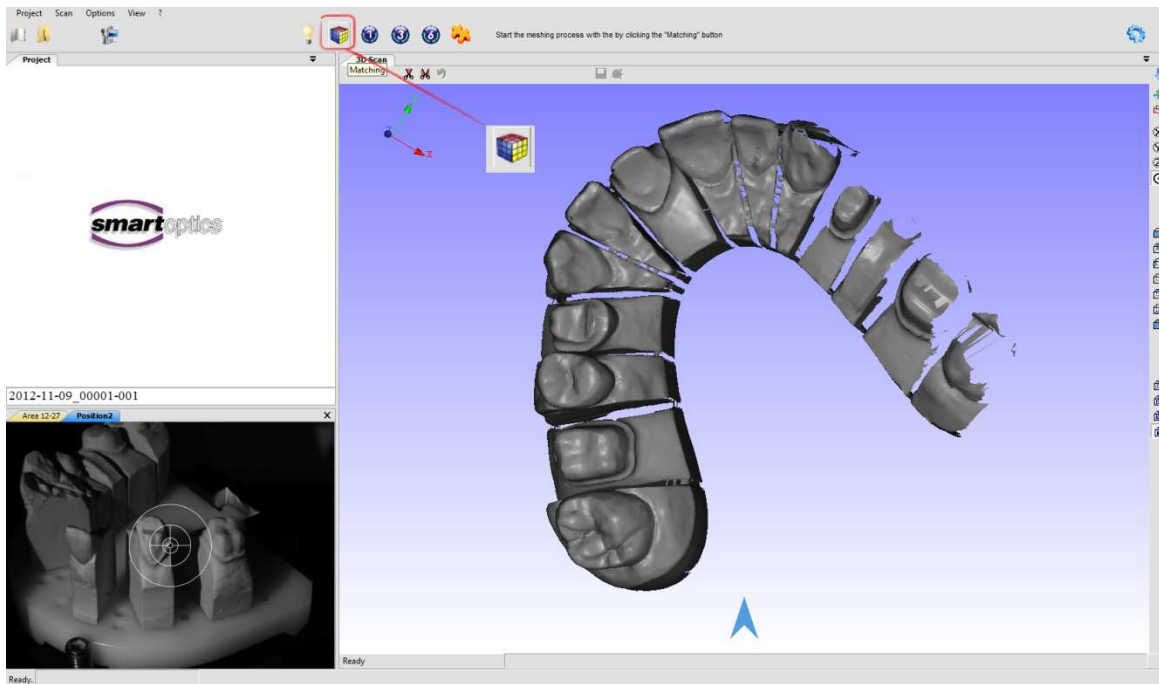
After activating the re-scanning function, define the name for the manual scan in the info window and confirm with "OK".




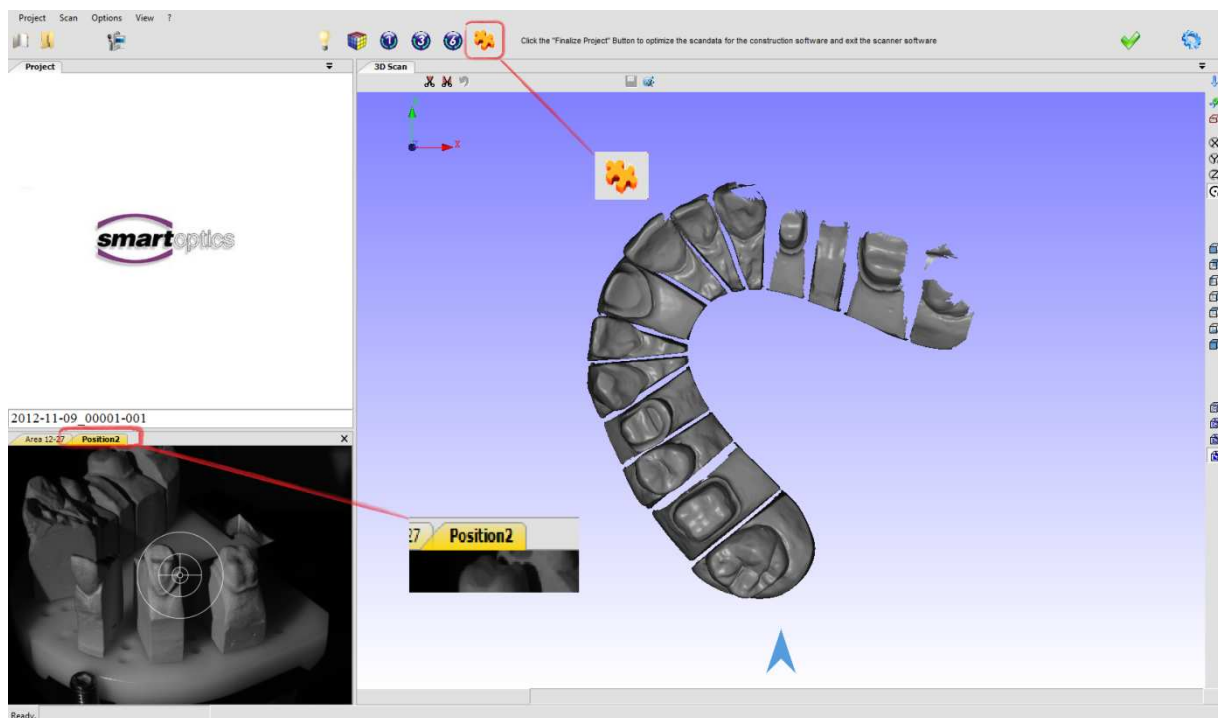
The manual scan can now be performed. At least 3 scans must be performed.



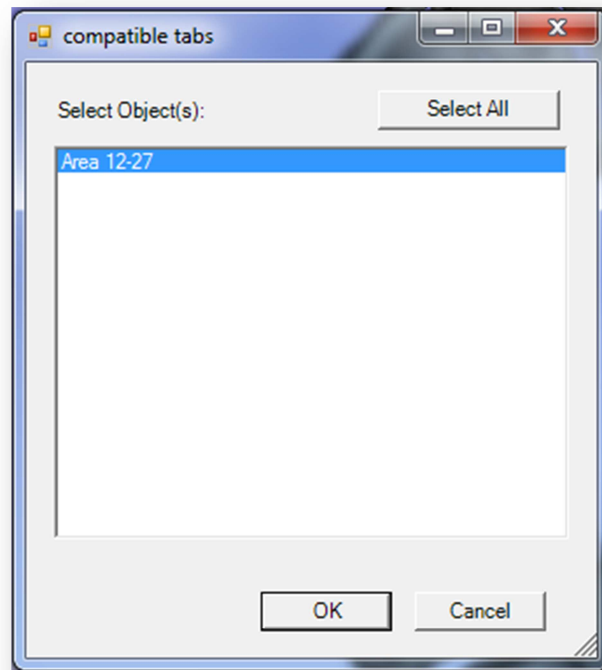
The scan can now be cut (see page 25) and then matched.




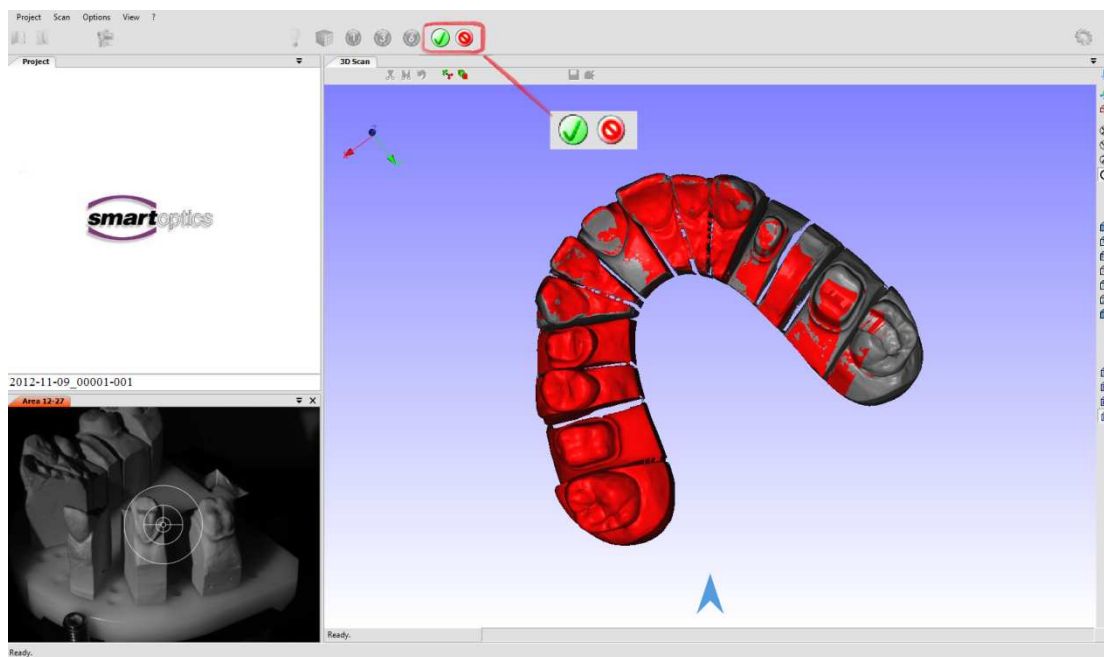
Then connect the manual scan to the area scan by clicking the button .




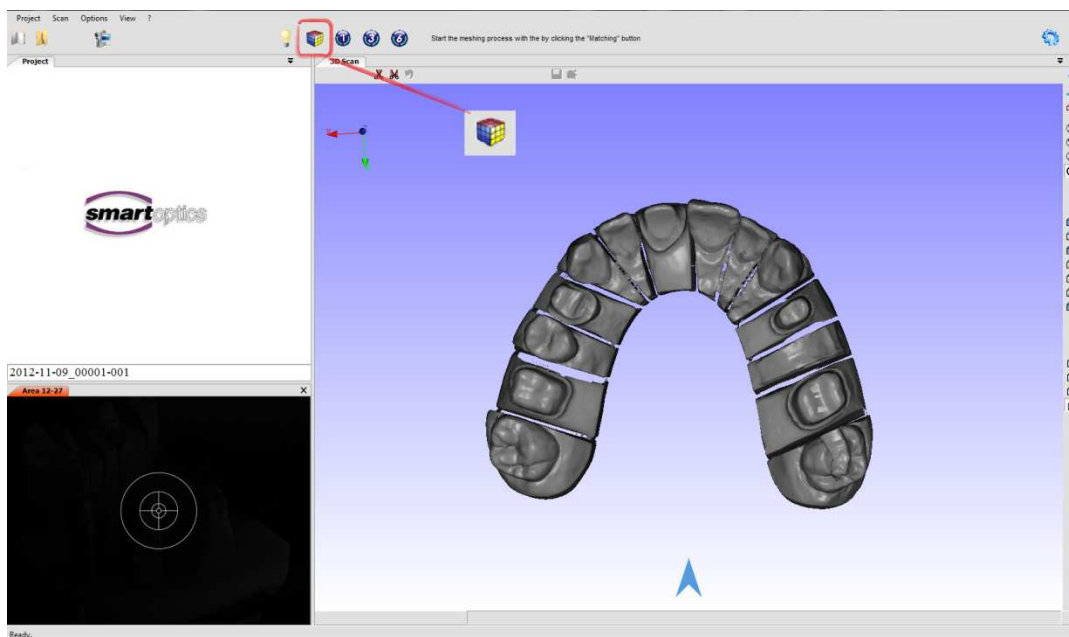
Select the area to be connected in the appearing info window and confirm with "OK".




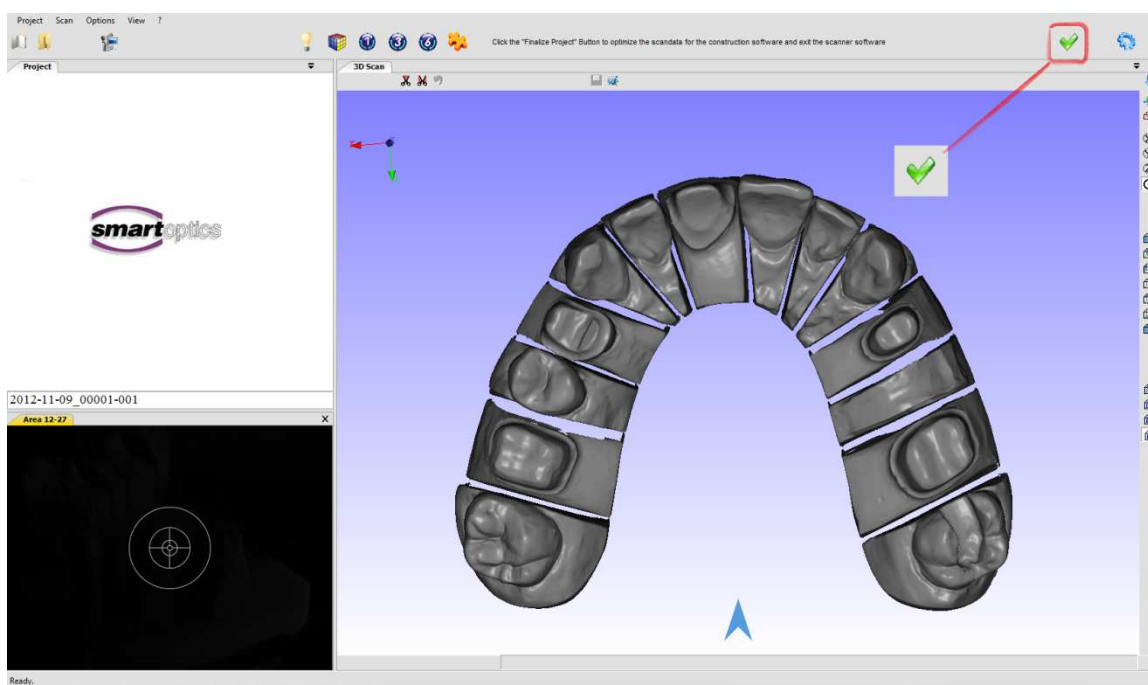
The connection between the manual scan and the area scan must be enabled automatically.
If there are insufficient comparable data available from the partial areas (page 37 ff), interrupt the connection by clicking button  and perform the manual scan once again.




If the manual scan has been performed to your satisfaction, click button  .



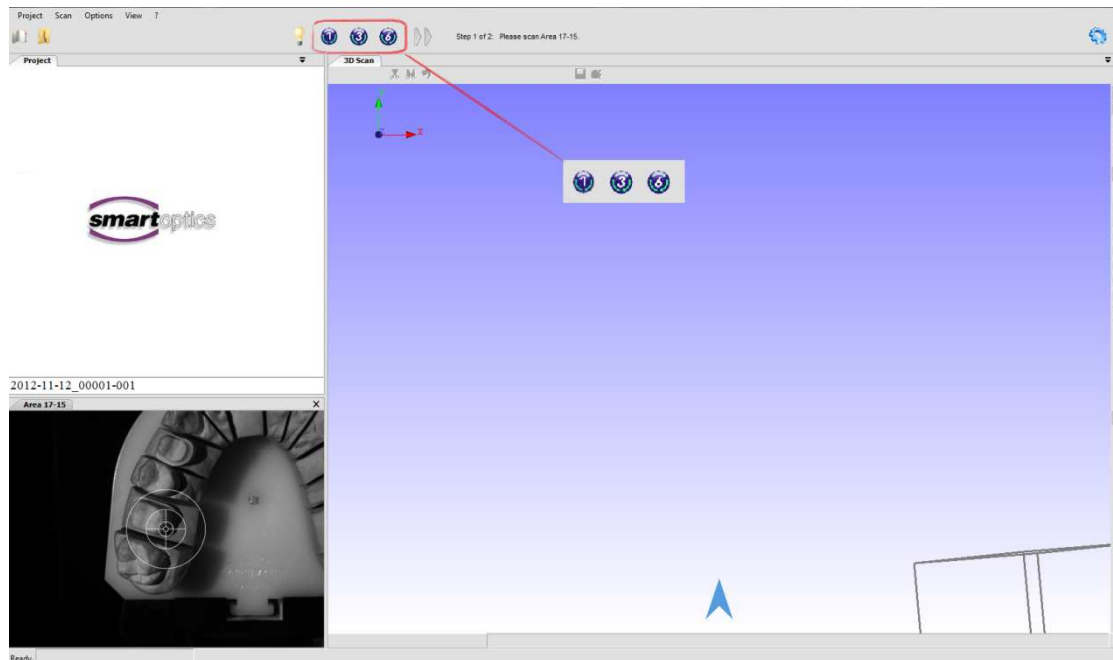
As a new measurement has to be connected to the area, this must be matched by clicking the button "Matching"  (to be recognised by the red highlighted tab).




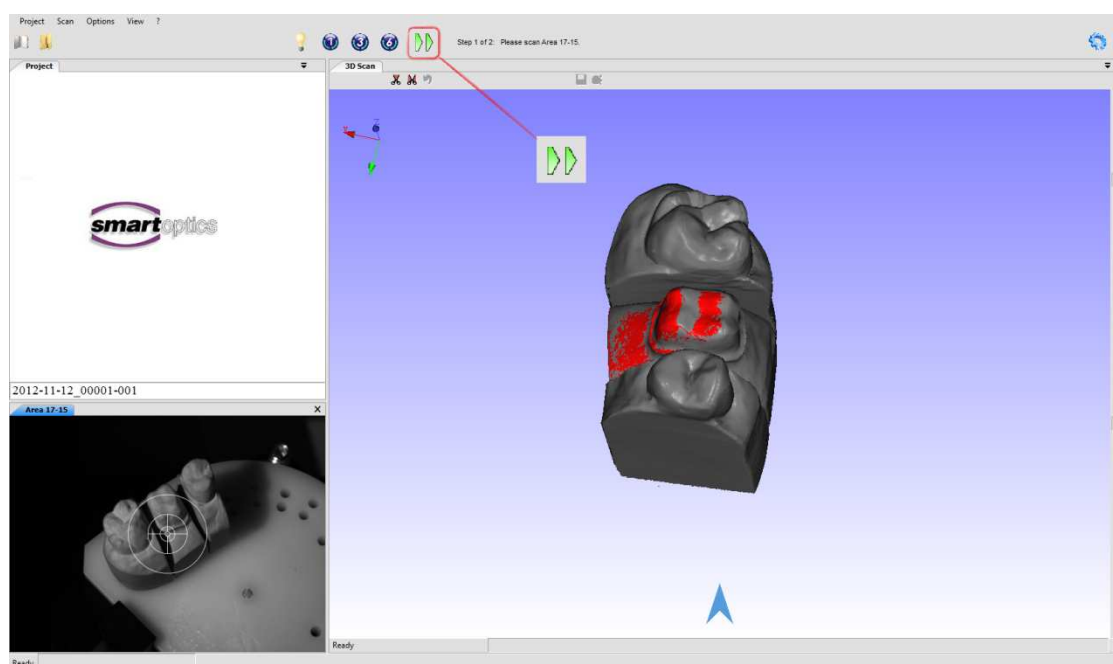
With the  button, the scan software can be ended.

9.8 Scan procedure operation with check bite

Scanning the first area without check bite.





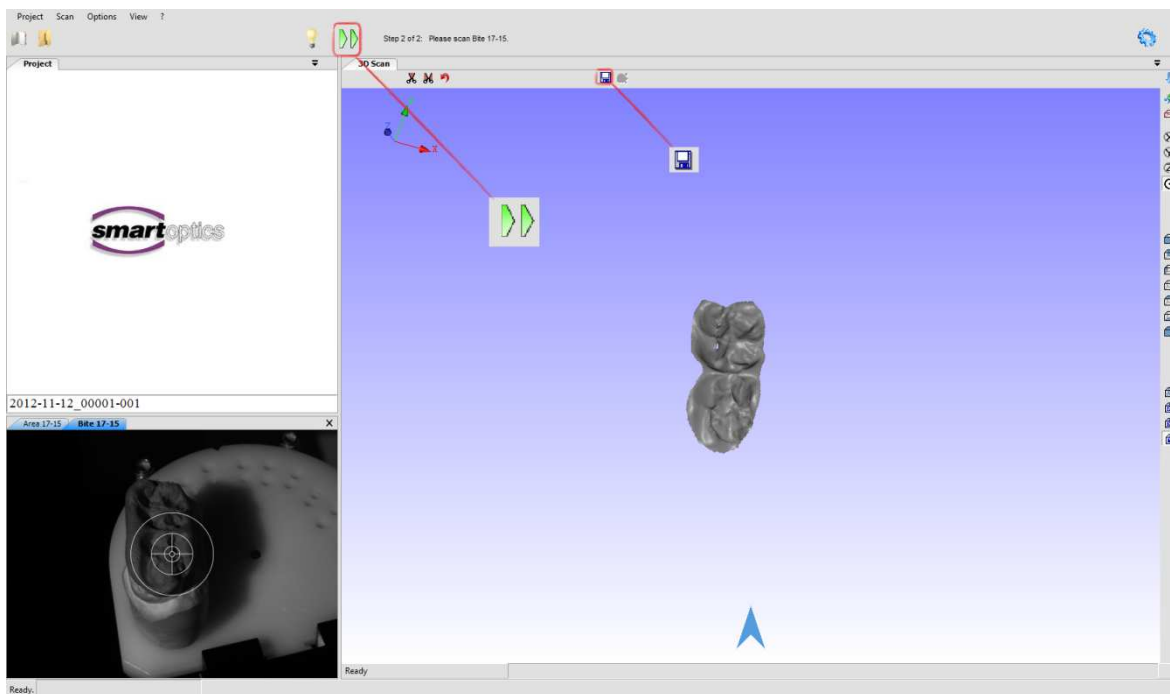
When the first area has been completely captured, continue by clicking the "Forwards" button  in Workflow.




If "Check bite" has been selected in the job mask, the command to scan the check bite will appear in the project info window. Position the model including the check bite centrically in the measuring field and begin the 2. area scan. Scan the check bite in the usual manner

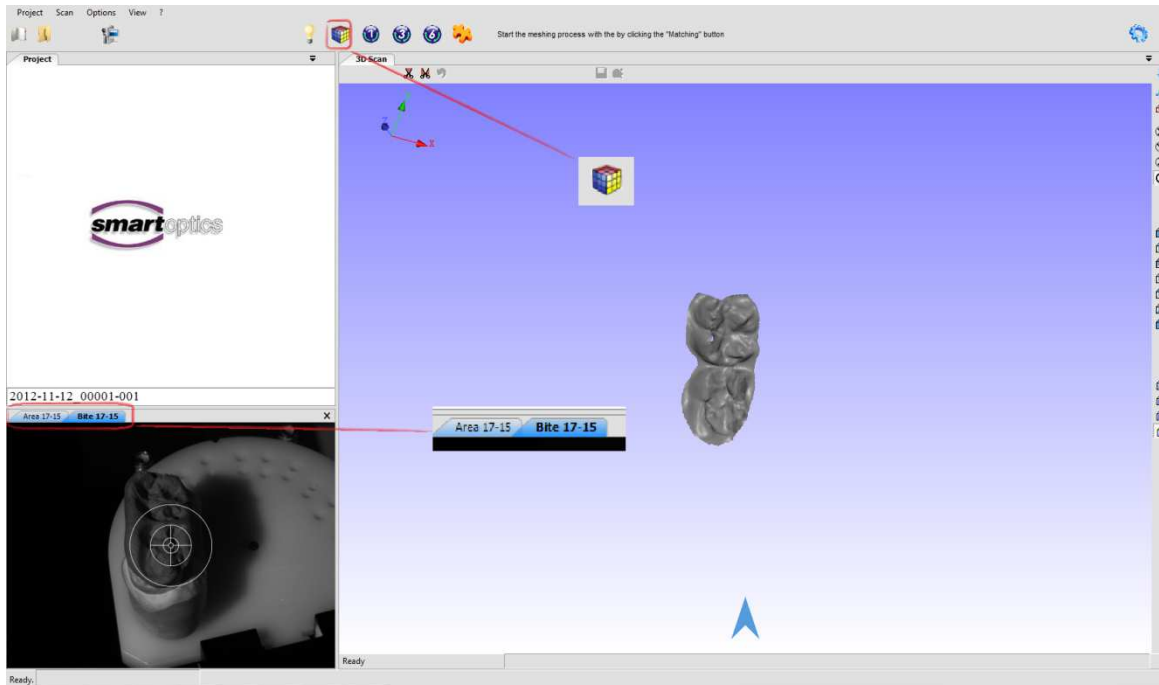
The positioning of the model base may not be changed.

After the check bite has been cut, confirm the new data situation with "Save" . Then continue the workflow by clicking the "Forwards" button .

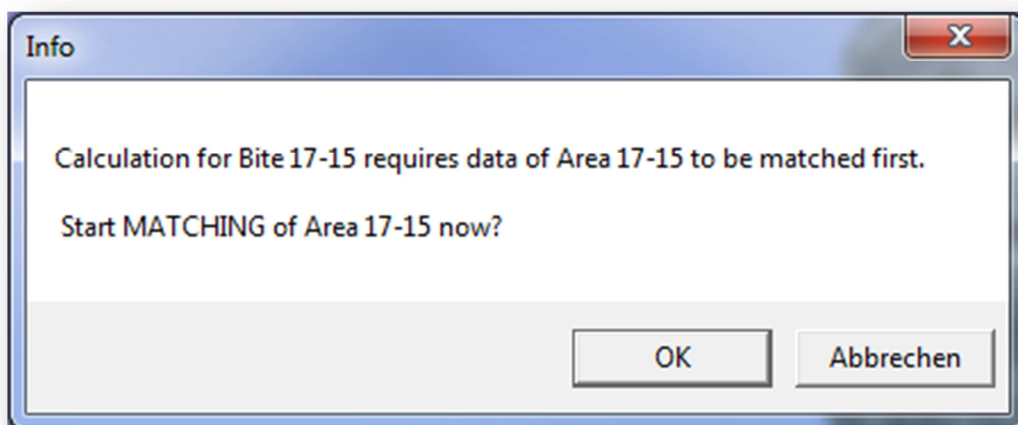



On completion of the complete scan of the check bite, this can be cut with the customary tool (page 20). For the subsequent computer aided design application, all areas that do not represent antagonists should be removed.

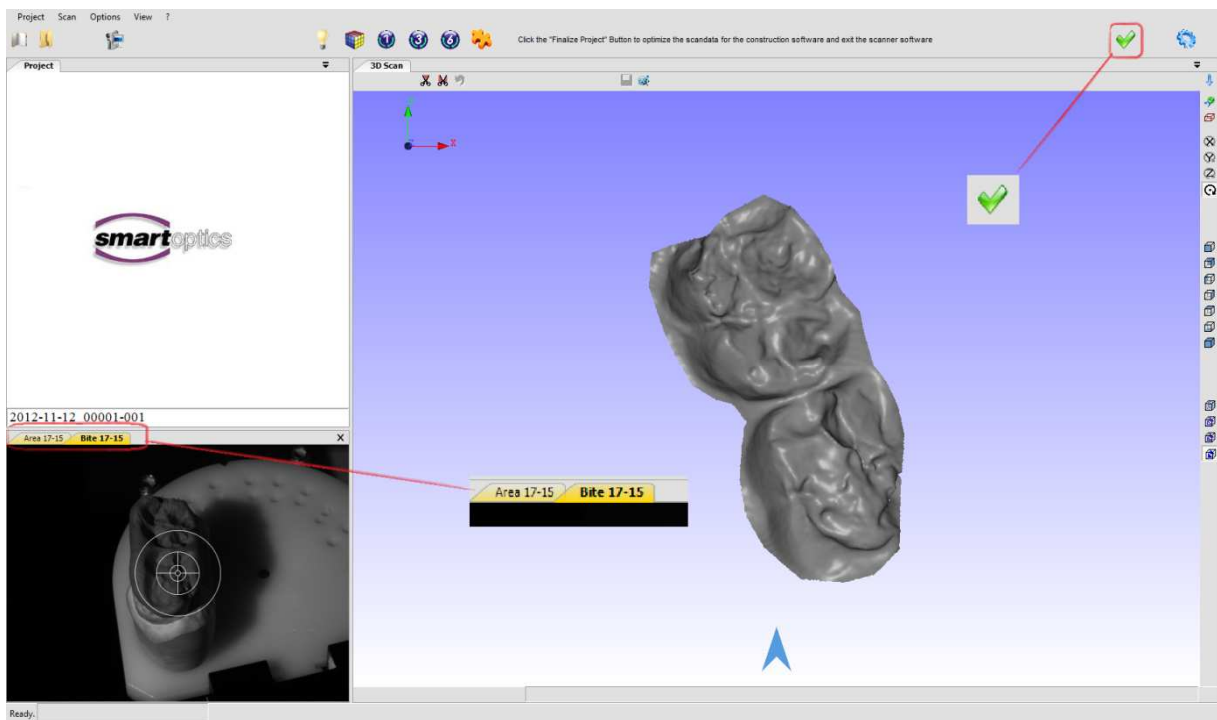
After successful data reduction, match the area and the check bite by clicking the "Matching" button 



Confirm information message with regard to matching with "OK". Afterwards the area and the check bite are matched automatically.



With the  button, the scan software can be ended.



10. GENERAL

In the case of multi-area scans, **all** tabs must be highlighted in yellow (=matched) to close the scan software.

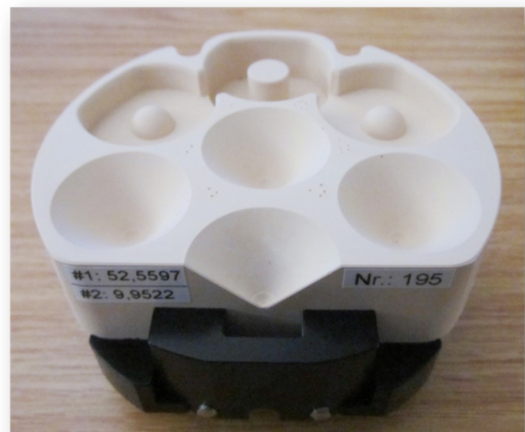
The maximum length of the model base may not exceed **6.8cm**, as otherwise the model support could collide with the swivel arm and damage the scanner

11. MAINTENANCE

11.1 Axis calibration

To ensure uniform, good scan results, the axis calibration should be performed every four weeks with the aid of the calibration model included in the delivery. This is mandatory after every transport of the instrument. Axis calibration is also recommended in event of temperature fluctuation of +/- 15 degree.

Secure the calibration body on the model holder and fix it in the scanner.

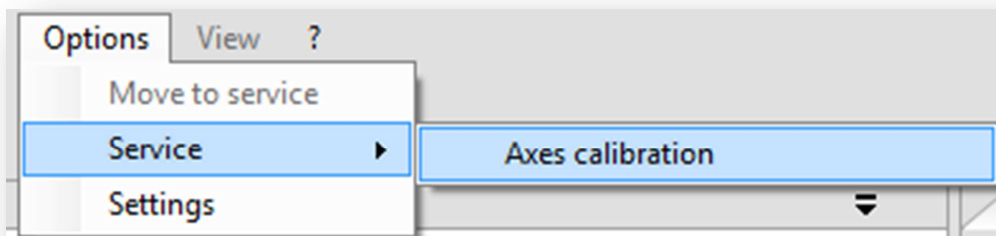


In order to check correct height alignment, tilt the axis by 45 degrees to the left. The live image shows aid lines for the height alignment for orientation purposes.

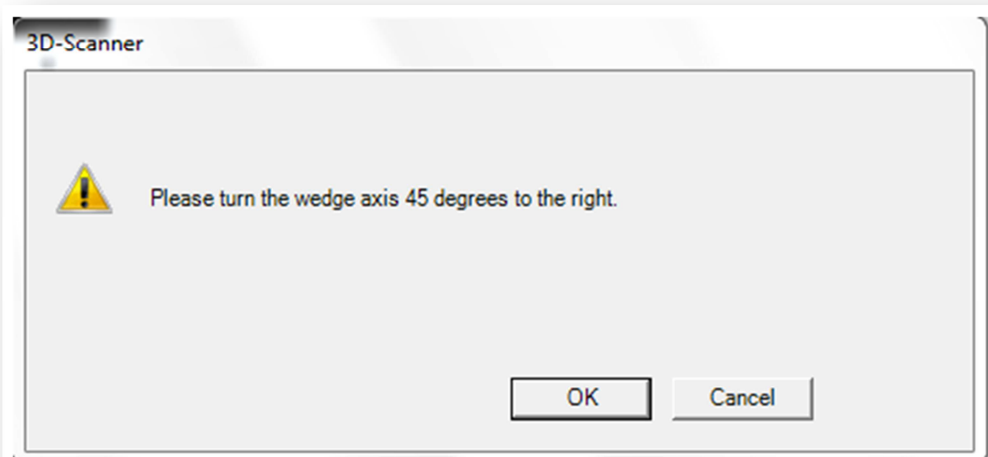


The calibration body should be aligned such that the upper edge of the calibration body is situated approx. 5 10mm above the middle green line.

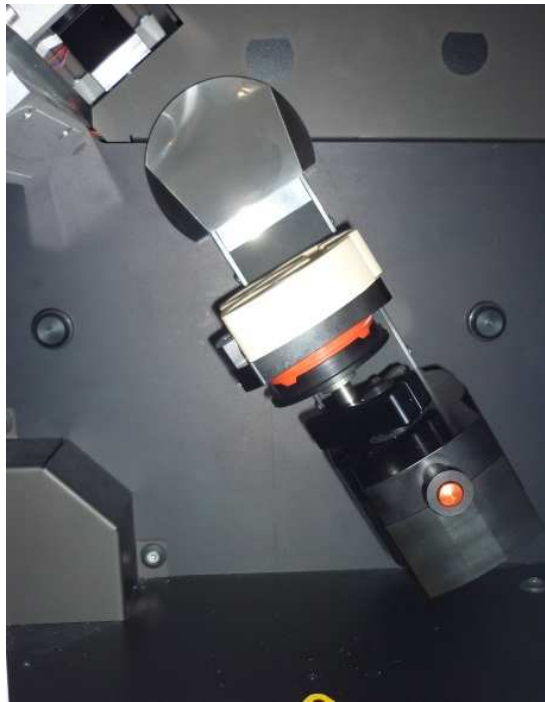
Start the axis calibration under *Options → Extras → Axis Calibration*



The instructions: "Tilt rocker approx. 45 degrees to the right" will appear.

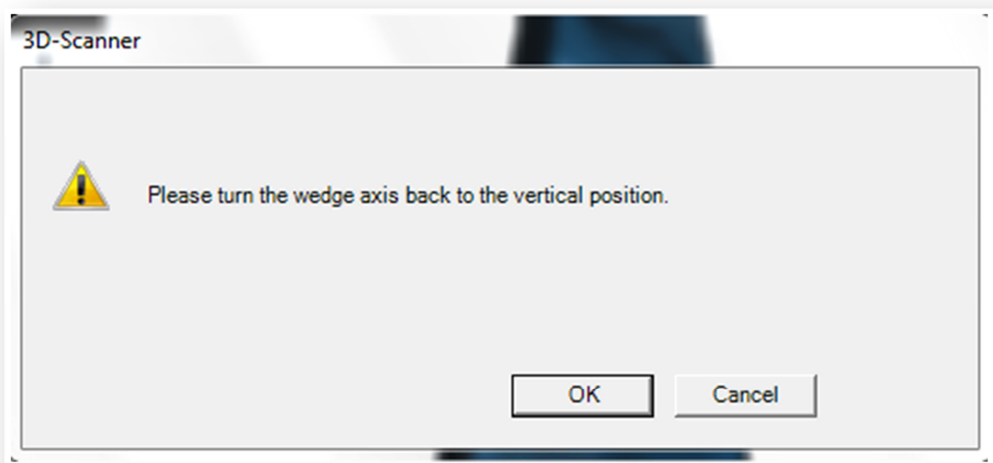


Align the rocker as shown in the figure.



When the rocker has been aligned, confirm the dialog with OK. The scanner automatically records some images.

The instructions: "Return rocker to upright position" then follow.

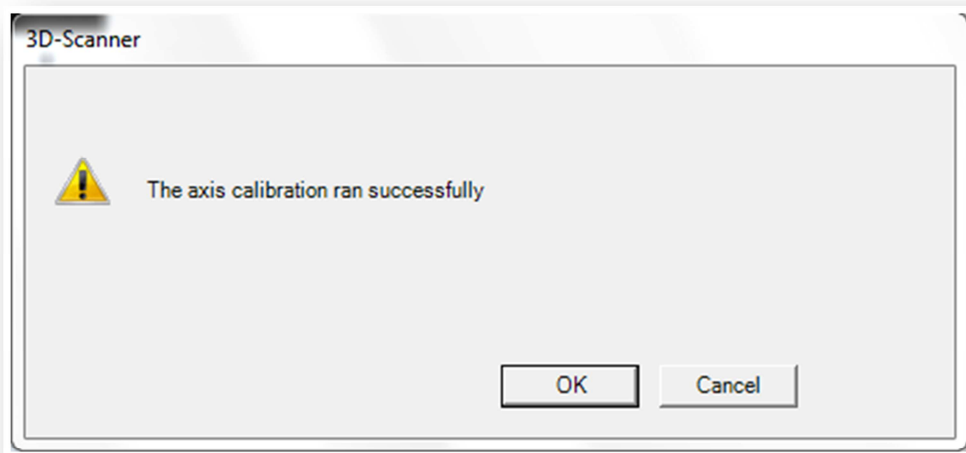


Re-align the rocker as shown in the figure.



When the rocker has been aligned, confirm the dialog with OK. The scanner automatically records some images.

After a few seconds, the message "Axis calibration successfully completed" is displayed.



Confirm the dialog with "OK" the axes of the scanner are now calibrated.

If the axis calibration should fail, check the correct height alignment, the correct seating of the calibration head and the seating of the securing screws again. Perform the axis calibration once again if you detect any faults here.

If no faults are detected, please contact the customer service.

11.2 Cleaning

The scanner should be cleaned regularly during operation. For cleaning, switch off the scanner and carefully remove any dust or foreign bodies from the bottom of the scanner using a vacuum cleaner.

You can also clean the scanner with a moistened microfibre cloth and in most cases this is sufficient. Do not use paper tissues or similar items as the surface is susceptible to scratching.

Abrasive detergents should not be used.

The optics of the 3D sensor are located in the top, left area of the interior of the scanner. As inappropriate cleaning measures could lead to damage, it is essential to abstain from such measures.

12. TROUBLE SHOOTING

The scanner is a sensitive optical instruments. Repair and maintenance work may only be carried out by qualified personnel.

Contact the customer service in the case of disturbance that is not remedied by restarting the scanner and the software.

13. ENVIRONMENT AND DISPOSAL

13.1 Packaging

You can return the packaging material to your specialist dealer for disposal.

However, we recommend that you keep the packaging in case you need it later for transporting the scanner or to return the scanner in warranty cases.

13.2 Disposal

The scanner should be returned to the manufacturer or special dealer for disposal.

The scanner is an instrument that is designed solely for commercial or industrial application.

Disposal by the public refuse collection is therefor not possible.

Please contact the specialist dealer or the manufacturer directly for disposal.

You can obtain further information in www.smartoptics.de under the category *Company → Environment → Unternehmen und Umwelt*.

WEEE -Registration number: DE47893210

14. EDITORIAL INFORMATION

Manufacturer:



smartoptics Sensortechnik GmbH

Sinterstr. 8a

D-44795 Bochum

We reserve the right to make changes in accordance with technical advancements.

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